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january, 1940 25 cents

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COLLINS 231 C

Collins 231C automatically controlled multi-frequency transmitters are an essential part of many radio communication systems. Some of these installations are entirely unattended and are operated from a distance of several miles. Up to ten frequencies are used and the frequency is instantly shifted several hundred times a day.

Collins Autotune completely solves the frequency shift problem. This device automatically re-positions all tuning adjustments for any of ten predetermined (but unrelated) frequencies within an interval of four seconds or less.

Second only to Collins Autotune in importance is the automatic control system. In certain arrangements the operator using only a microphone, key and telephone dial linked to the transmitter over a single telephone circuit is able to control the transmitter completely.

Power Output: 1000 watts.

Frequency Range: 2,500-20,000 kc.

Number of Frequencies: 10 frequencies throughout the range.

Frequency Stability: .03% to .01% depending on rating of crystal.

Antenna Impedance: Unbalanced antennas and transmission lines having an impedance of 70 to 600 ohms with up to 60° phase angle. Balanced antennas and transmission lines having an impedance of 300 to 2,500 ohms with up to 60° phase angle.

Audio Response: Rising audio response 150 cycles to 500 cycles and within ± 2 db between 500 cycles and 2,500 cycles. Response at 60 and 3,000 cycles more than 40 db below 1,000 cycle reference. Audio response may be modified for different types of service.

Amplitude Distortion: The amplitude distortion less than 6% RMS total harmonics at any modulation level up to 100%.

Residual Carrier Modulation: More than 40 db below 100% modulation.

Carrier Shift: Less than 2% at 100% modulation.

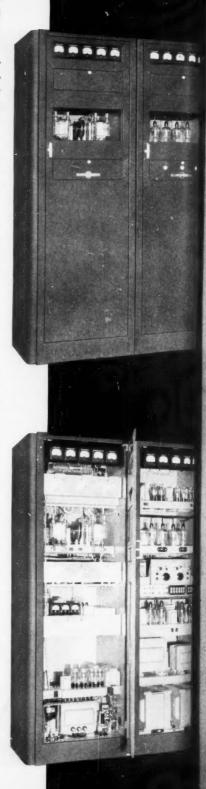
Keying System: Tube producing essentially square wave impulses at rates up to 5,000 c.p.s. For manual and machine keying or facsimile.

Power Requirements: Two or three phase, 220V. 50/60 cycles. A1: 3.46 kw. A3, 100% mod: 4.44 kw. Power factor: 90%.

Size: Two cabinets, each 78" high by 24" deep by 24" wide.

CELLINS RADIO COMPANY

CEDAR RAPIDS, IOWA NEW YORK, N. Y: 11 WEST 42 ST.



JANUARY 1940

VOLUME XXIV NUMBER 1

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AMATEUR RADIO

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Frogressive Series DE MOR



assures exact frequency measurements on all amateur bands. sion indicated by 360° of the compass. The 660 Mol stages and Directional Loop MODEL 437 incorporate tw and BFO. The 650 Presel inches of Electrical Band additional R. F

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LT is the Christmas season, that time of year when the amateur radio fraternity is accustomed to spreading its greetings not only over the whole countryside but to its fellows in every corner of the world. It comes this year to a world beset by strife, a world in which there walks abroad unhappily little of the spirit of the Christ. Instead, appalling tragedy stalks much of the surface of the earth. It is close to us hams, because time and distance have meant nothing to us in our intercommunication. We miss this Christmas the cheery signals of our friends in many foreign

Radio amateurs of the American republics, let us this season count our blessings and be grateful for them! Join us at the headquarters of I.A.R.U.-A.R.R.L. in wishing radio amateurs everywhere the best possible of Christmases! And may the New Year bring us together again in peace and plenty!

As old 1939 signs off, it may do us some good to look back over the months and see what we have done to our technical and operating practices. In general, one must conclude that our art is growing up, for there were no startling and exciting new developments. Rather, it was a period of consolidating and applying previous knowledge, resulting in a general raising of performance. With an infinitude of high-efficiency parts available, amateur radio sailed in with glee and it is probable that there was more new gear built in 1939 than ever before.

The clean-up of the 5-meter band under the new regulations was first a staggering blow to occupancy. But soon there was a splendid recovery, as stable signals made possible the use of high-gain high-selectivity receivers and immensely extended station ranges. Net result now is greatly increasing interest, on a much more satisfactory basis. The year brought us some interesting breaks in the weather and added to our knowledge of transmission phenomena. The transceivers moved to $2\frac{1}{2}$ and gave that band its greatest population, while the hardier experimenters moved on to build resonant-line oscillators for 11/4. Organized operating came into the u.h.f. field. The ultra-high crowd enter 1940 poised for great

things.

There was immense interest in the operating contests of the year, and both the DX contest and Field Day enjoyed record participation. With no major communication emergencies, amateur radio gave an admirable account of itself on a score of lesser occasions and, through its Field Day exercises, gave guaranty of its ability to bring an unparalleled quantity of truly portable equipment into play whenever an emergency requires it.

We became safety conscious in 1939. Realizing as never before the lurking death behind each careless practice, we examined our situation, codified our construction and our operating practices, and resolved always to "Switch to Safety."

1939 was unquestionably the high year for the installation of high-gain directive antenna systems, particularly of the close-spaced rotary type. The coaxial came to amateur radio this year, and we learned much about the more efficient transmission of power from transmitter to antenna, while the mechanics of rotaries gave us a fair introduction to mechanical engineering. With nothing particularly new, we have gained because we are more antenna-conscious, are doing more applying of what we know.

The doctrine of "frequency measurement and regular check" grew on us, and we became not only more frequency-conscious but better able to measure our frequencies. Secondary frequency standards came to many stations, and band-edge locators with stable oscillators were the order of the day. With little startling in new tubes, refinement brought us better ones for less money. In the field of reception there was, therefore, increased interest in building receivers of greater performance with fewer tubes, and we daresay there were more home-made superhet receivers built in 1939 than ever before. And this despite the appearance on the market of vastly better low-priced receivers than any previous year had enjoyed. We should mention, too, further developments in noise limiters and audio-frequency bridges that contributed nicely to working through interference. In transmitters particularly it was a case of consolidating earlier gains. The trend was towards compactness and portability. The stable e.c.o. definitely ingratiated itself. All-band tanks offer new convenience in 1940. 'Phone design showed a commendable trend towards experimenting to gain more dollar-efficiency. The 1938 development of high-efficiency grid modulation reached our ranks, as did volume compression and the control of splatter, while cathode modulation made a new bow.

Nothing startling, did we say? Frequencymodulation is definitely so, and in the closing months of 1939 we were increasingly interested in its possibilities for overcoming "man-made static" in our u.h.f. work, as well as in greatly simplifying transmitting equipment. But this belongs more in our 1940 story.

War laid its heavy hand on our foreign fellows, cut them off from us, left us only the hope for reunion in 1940. But our own numbers in the States grew to over 54,000 and we demonstrated splendidly the trust that our nation can put in us as citizens aware of our responsibilities in a mad world.

Spirit, interest, skill, technic, sense of responsibility—all seem to have precisely what it takes for a grand new year as 1940 runs up the gain control and comes booming into our lives!

K. B. W.

SPLATTER

After we had finished reading "Doc" Kelley's "Personality Over the Air" we experienced an urge to take a whack at the same idea from another angle. Along with our note to Gil asking for the usual atmosphere we suggested a pen sketch of the author from an impression after he had read the story. Here it is!



Apparently the greatest error that Gil made was in supplying the subject with a mustache he did not possess — certainly true at the time the résumé was written.

Our Cover

You'll recognize this photo of Mix's amplifier as featured in QST last month. It was supposed to be our best cover idea for the month—at least until that scoop shot of Byrd's North Star arrived. We've tried several times to be convinced that the amplifier is now a dead issue but, with such a crisp photograph, we just couldn't resist the temptation. No, it has nothing to do with frequency modulation, but there is plenty in this issue that does—and in issues to come, for it looks like something you just won't be without if you are interested at all in the ultra-highs.

Foreign Calls Heard Lists Wanted

If you are an amateur in a country where officialdom doled out the quietus, you may still be able to listen in on the ham bands but not be able to do anything about it as far as flipping the old switch from receive to send. Would you get any satisfaction from logging the stations that you are able to hear and sending in the list to us for publication in QST?

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So that these lists will still mean something, that is, be an exhibition of a fair piece of transmission as well as reception, we suggest that no calls of stations heard on the 14-Mc. band be included. Use all the other bands and, just for sport, plenty of diversification in covering the entire spectrum. This should certainly produce some interesting evidence of how ham signals are traveling these days. As for the Canadian boys, we suggest that they confine their lists to the ultra-high frequencies or the lower-frequency (Continued on page 58)

FEEDBACK

P. 51, December QST

Stray on Central Techno-Services carried incorrect address. The address is 302 Fifth Ave., New York City.

Fig. 1, p. 51, November QST

Output tank of 809 should have a ground on the rotor of C_{23} where joining C_{22} .

P. 47, December QST

The jack bars mentioned in the righthand paragraph were made of mycalex, which can be drilled — not isolantite.

Runover in the same article on page 90 should have a sentence correction "— and the cathode return lead which goes to terminal 7 on the same unit."

Wide-band frequency modulation is well on its way to a secure and expanding position in the broadcast field. To our way of thinking, it is going to carve out an important place for itself in the ham picture too. Its remarkable discrimination against man-made static as well as other types of amplitude noise make it a "natural" for ignition-ridden u.h.f. bands.

The experimenter, surfeited with the continual variations on the old theme of amplitude modulation, will find plenty to excite his interest and enthusiasm in the wide-band f.m. system, where some of our present conceptions have to be unlearned and supplanted by entirely new ideas. Here's the dope on how to get started on "F.M."

Wide-Band Frequency Modulation in Amateur Communication

Its Application and Advantages for U.H.F. Work

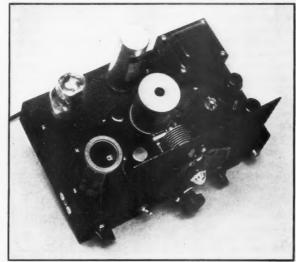
BY GEORGE GRAMMER* AND BYRON GOODMAN**

REQUENCY modulation, like a weed in a flower bed, has been an undesirable offshoot which we've tried our best to eradicate in times past. With good reason, too, since it is a demonstrable fact that for transmission of the same type of intelligence a greater channel width is needed than for the familiar amplitude-modulation system, and space has been at a premium on our lower-frequency bands. But the ugly duckling is rapidly sprouting swan feathers in u.h.f. broad-

casting, thanks to an entirely different method of attack by Major Armstrong,1 and it behooves us to give a good look at frequency modulation and its application to amateur communication.

Now no miracles have been performed in making the frequency-modulated signal occupy less space than it used to; instead, the secret of f.m. performance lies in deliberately using up a whole lot more space than the amplitude-modulated signal takes. Therefore f.m. will have to be confined to the ultra-highfrequency region, where we have megacycles rather than kilocycles to play with, and where, because of shorter transmission ranges, an area like that of the United States can accommodate a tremendous number of stations all working on the same frequency without interference. At ultra-high frequencies, too, is where the outstanding inherent characteristic of f.m., reduction of response to noise, particularly noise from ignition systems and other man-devised racket makers, is of most importance. Even the most sceptical will come away a confirmed rooter after a demonstration of a.m. versus f.m. in the presence of severe QRN of this type.

As we see it, the outstanding advantages of f.m. for amateur work are QRN reduction and simplification of transmitter equipment. The broadcasters, given an opportunity to start out



Modulation equipment is simple, compact and inexpensive. This 7 by 11 chassis contains frequency control and buffer units, the frequency modulator, speech amplifier and power supply.

The oscillator coil is in the round shield can in the center. The coil in the left foreground is the buffer output circuit. Speech amplifier and modulator are at the right, with the power supply along the rear edge.

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^{*} Technical Editor.

^{**} Asst. Technical Editor.

1 E. H. Armstrong, "A Method of Reducing Disturbances in Radio Signalling by a System of Frequency Modulation," Proc. I.R.E., May,

afresh in new fields, are making the most of it by improving fidelity to the extent of transmitting audio frequencies up to 15,000 cycles, but we

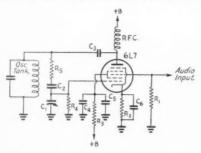


Fig. 1 — The frequency-modulator circuit.

- 3-30-μμfd. compression trimmer.

C2, C8 -C₂, C₈ — $250 \cdot \mu \mu fd$. mica. C₄ — 0.01 · μfd . paper.

C5 — 8-µfd. electrolytic, 450-volt.

 $C_6 - 0.01$ - μ fd. paper. $R_1 - 0.5$ megohm.

 $R_2 - 300$ ohms.

Rs - 30,000 ohms, 1-watt.

R4 - 0.5 megohm.

- 50,000 ohms RFC - 2.5-mh. r.f. choke.

need not look at that angle since our present audio range is quite adequate for communication purposes. In addition, there are secondary advantages, some of which apply particularly to the 112-Mc. band, where amateur frequency modulation must get its start. Let's take them in turn:

Noise reduction: The extent to which a frequency-modulation receiver discriminates against external noise, particularly of the impulse type, is remarkable. In some tests at W1INF, at A.R.R.L. Headquarters, where ignition and noises from electrical machinery are particularly bad on ultra-high frequencies, a perfectly readable f.m. signal could be obtained when an a.m. signal of the same carrier strength was sunk without a trace in the noise. Indeed, it seems that almost the only limit to the improvement which can be obtained in this respect is when the f.m. signal drops to the level of the inherent hiss-type noise in the receiver. With the latter type of noise

the f.m. receiver is at some disadvantage with respect to the a.m. receiver unless the incoming carrier strength is equal to or greater than that of the hiss.2 This statement is subject to several qualifications, and in any event applies only to signals which are very weak and are readable on an a.m. receiver only when there is no external QRN. When the carrier becomes somewhat stronger than the hiss the signal-to-noise ratio in the f.m. receiver increases to many times (of the order of 20 db) that in an a.m. receiver having the same carrier input. Hence the silent background which is an outstanding feature of f.m. reception.

Transmitter simplification: The power required for modulation of the carrier is inconsequential, no matter what the final carrier output of the transmitter. Modulation may be applied directly to the frequency-control element, and all succeeding transmitter stages may be operated in any fashion desired, without regard to amplitude linearity. The following stages may be, and often are, frequency multipliers. Excitation worries are confined to getting power output from a stage; there is no such thing as supplying "enough excitation for linear operation" of a Class-C stage, nor critical circuit adjustments for Class-B amplification. Any stage can be loaded as one pleases. The final tubes can be operated Class-C at maximum ratings, since the plate input does not change. For the same reason, there are no condenser flashovers or equipment breakdowns from modulation peaks. Audio power amplifiers of any sort are unnecessary, since it is readily possible to get adequate frequency swing with a speech amplifier output of but a few volts at practically no power. An f.m. transmitter takes only about half the equipment needed for an a.m. transmitter of the same carrier power.

Receiver performance: At the present state of u.h.f. technique, it is difficult - even though perhaps not theoretically impossible - to obtain sufficient frequency stability on 112 Mc. to permit the use of the order of selectivity obtainable in the ordinary narrow-band a.m. i.f. amplifier.

² Murray C. Crosby, "Frequency Modulation Noise Characteristics," *Proc. I.R.E.*, April, 1937.

Fig. 2 -- The oscillatorbuffer circuit.

C1 - 250-µµfd. fixed drift mica.

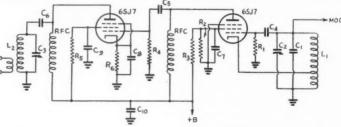
C2 - 100-μμfd. variable. C₃ — 50-µµfd. variable.

 $C_4 - 100$ - $\mu\mu$ fd. mica.

 $C_5 - 250$ - $\mu\mu$ fd. mica. $C_6 - 0.001$ - μ fd. mica.

C7,-C10, inc. 0.01-µfd.

paper. R₁ — 100,000 ohms. $R_2 - 25,000$ ohms, 1-watt.



50,000 ohms, 1-watt. $R_4 - 50,000 \text{ ohms}$

R5 - 50,000 ohms, 1-watt.

R₆ — 300 ohms. RFC — 2.5-mh. r.f. choke.

L₁ - 10 turns No. 18, length 1 inch, diameter, 1

inch, tapped 3rd turn from ground.
20 turns No. 18, length 1½ inches, diameter 11/2 inches

Link 5 turns at ground end.

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This applies particularly to the h.f. oscillator in a superhet receiver, although transmitter instability is likewise greater than on lower frequencies, in terms of "absolute kilocycle" rather than percentage. There is usually some hum frequency modulation of the receiver oscillator, even with careful construction, at least when ordinary tuned circuits are used. As a result, the 112-Mc. superhet must have a relatively-wide-band i.f. if satisfactory results are to be secured with amplitude modulation. That being the case, not a great deal of selectivity need be sacrificed by using frequency modulation.

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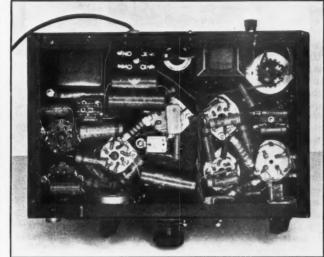
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In connection with selectivity, one of the peculiar effects of f.m. transmissions has to be taken into consideration. Signals on or near the same frequency will not cause mutual interference unless the carrier strengths are almost identi-

cal. If the strengths differ by as little as 2 to 1 the stronger signal takes control of the receiver and the others are unheard. For the most part, therefore, the use of rotary antennas (easy to build on ultra-high frequencies) should give a higher order of effective selectivity than is possible with amplitude modulation. We have some new experiences waiting for us in this respect.

The two systems, f.m. and a.m., are not mutually exclusive; that is, an f.m. receiver can be manipulated to receive a.m. signals fairly well, while an a.m. receiver will, with careful tuning and some cooperation on the part of the transmitting operator, give fairly decent reception of f.m. signals. A superregenerative receiver will work just about as well on f.m. as on a.m. transmissions; in fact, it seems likely that a good deal



In this bottom view of the transmitting unit, the r.f. section is at the right and the audio at the left. The oscillator socket is the one just to the right of the coil socket in the center.

of the reception of unstable modulated oscillators has all along been by f.m. rather than a.m.

Finally, a modulated oscillator on 112 Mc. is easily receivable on an f.m. superhet - receivable, too, with less noise. And since the average 112-Mc. modulated oscillator swings over a considerably wider frequency range than is necessary for good f.m. reception, it becomes possible to reduce the percentage of amplitude modulation to the point which fits the receiver's frequency band, thus saving on modulator size and power. Of course the thing can be carried to its logical end and the oscillator given pure frequency modulation rather than frequency modulation via amplitude modulation, thus dispensing altogether with modulator power. We like the possibilities that this procedure opens for portable and

mobile operation.

Since the principles of frequency modulation have already been discussed in QST, we shall confine ourselves here to a discussion of the various factors which apply particularly to amateur communication with frequency-modulated signals. We urge those who are not familiar with the system to give Prof. Noble's article a careful reading.

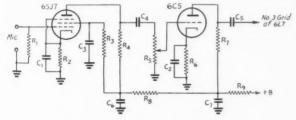


Fig. 3 — The speech amplifier circuit.

C1, C2 - 10-µfd. 25-volt electro- R3 - 1 megohm. Vytic.
C₃ — 0.1-µfd. paper.
C₄, C₅ — 0.01-µfd. paper.
C₆, C₇ — 8-µfd. 450-volt electro-R₄ - 0.25 megohm. Rs - 0.5-megohm potentiometer.

R6 - 2000 ohms. lytic. R7 - 50,000 ohms.

 $R_1 - 5$ megohms. Rs - 0.25 megohm. $R_2 - 900$ ohms. R₉ — 150,000 ohms, 1-watt.

Standards

Percentage of modulation has no meaning in frequency modulation. The thing that counts is the frequency deviation from the carrier frequency for a modulating signal of the highest ³ D. E. Noble, "Frequency Modulation Funda-

mentals," QST, August, 1939.

amplitude; that is, the frequency "swing" with the loudest sounds actuating the microphone. So far as the transmitter is concerned, there is no inherent limitation to the amount of swing or deviation that can be used; the only requirement to be met is that for distortionless modulation the deviation in frequency must be linear with respect to the amplitude of the modulating voltage. In practice, the limitation occurs in the receiver, in that it becomes necessary to select some pass band over which the amplitude of

the audio output can be held linear with respect to the frequency deviations of the incoming signal.

It is desirable, therefore, to set up tentatively at least some standards for amateur work. There is no need for such standards to be taken rigorously, however, since only practical use of the system will show what final standards will be desirable. The various factors to be taken into consideration include the amount of linear deviation which it is possible to secure at the transmitter by simple methods, the amount of receiver selectivity and gain necessary, and the requirements of the system for good noise reduction.

Perhaps the simplest method of generating f.m. signals is to frequency-modulate a self-controlled oscillator, in which case some compromise must be made between building an inherently stable oscillator (to minimize drift and unwanted hum modulation) and building one which is quite sensitive to the modulating voltage. In the receiver, the wider the band accepted the lower the gain, for a given number of amplifier stages. On the other hand, the mechanics of the system are such that the wider the band the better the noise suppression. Present broadcast practice is to use a deviation ratio, or ratio of maximum frequency swing on one side of the carrier to the highest audio frequency transmitted, of about 5.

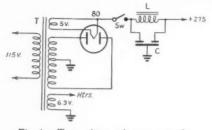


Fig. 4 - Transmitter unit power supply. Power transformer, 250 volts at 40 ma., with 6.3.

volt, 2-amp. filament winding. — 10-henry, 40-ma. choke. — Dual-8 electrolytic, 450-volt.

- S.p.s.t. toggle switch.

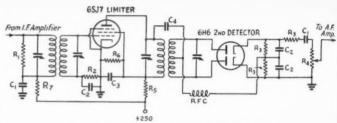


Fig. 5 — The limiter and second detector circuit.

- 0.01-μfd. 400-volt paper. - 0.0001-μfd. mica

-0.1-µfd. 400-volt paper. - 30-uufd. mica.

Ri - 10,000 ohms, 1/2-watt. - 300,000 ohms, 1-watt. R₃ - 100,000 ohms, 1/2-watt.

R4 - 1-megohm potentiometer. R6 - 1000 ohms, 1-watt (A 5000. ohm wirewound potentiom. eter could be used here to good advantage). R7 — 2000-ohms, ½-watt. RFC — 2.5 mh. r.f. choke.

R5 - 25,000-ohm 10-watt wirewound.

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See text for i.f. transformer data.

It seemed to us that for a starter the same deviation ratio would be about right for amateur work. Since we are interested only in transmitting audio frequencies up to 4000 or 5000 cycles for voice work, the total deviation necessary would be 20 to 25 kc. This is relatively easy to get at the transmitter even with a stable high-C oscillator, and also represents a satisfactory receiver compromise in that a band-width of 40 to 50 kc. is not too great for moderately good selectivity at 112 Mc., but still permits considerably higher per-stage gains than the 200-kc. band used in b.c. receivers.

The experimental equipment described here is based on such a standard. With the receiver aligned to give flat response over a 50-kc. band there will be some a.f. distortion introduced if the transmitter deviation exceeds 25 kc.; it is a simple matter to hold the modulation within whatever limits the receiver may impose. If the deviation is less than the receiver will accept the audio output will drop, just as less than 100% modulation gives lower audio volume in the amplitude system. It is desirable to swing the transmitter frequency over the full receiver range.

Modulation

The transmitter control unit shown combines an oscillator for transmitter frequency control, a buffer amplifier, the frequency modulator, a speech amplifier with enough gain for a crystal microphone, and a power supply for these circuits. It does not by any means represent the only way in which the job can be done, having been built to work into an already-existing 112-Mc. transmitter we had set up at W1INF. Since the latter outfit started out with a 7-Mc. crystal, the control unit was simply constructed to feed into the crystal stage so that stabilized f.m. could be put on the air with as little fuss as possible. It was also convenient for us to combine the various elements into one unit, although this is not essential.

The various elements of the transmitter unit are

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shown separately in Figs. 1 to 4, inclusive. Fig. 2 is a rather conventional e.c.o. coupled through a choke-condenser-resistor combination to the grid of the buffer stage, the output circuit of which is tuned. The oscillator operates on 7 Mc. and uses a high-C tank circuit. Fig. 3 shows the two-stage speech amplifier, which also is quite straightforward in design. The network comprised by R_3 , R_9 , C_6 and C_7 is for plate-supply filtering in addition to that provided by the LC filter in the power supply shown in Fig. 4. The only unfamiliar device is the frequency modulator shown in Fig. 1.

The modulator circuit is of the a.f.c. type, in which the control tube acts as a variable inductance, except that instead of holding the frequency constant it is "worked backwards": that is, it is used to vary the oscillator frequency at an audiofrequency rate. The operation of the device is no doubt familiar to those who service broadcast receivers, but is worth describing for the benefit of others who have not had occasion to use it. The control grid circuit of the modulator is connected across the small capacity C_1 , which is in series with resistor Rs across the oscillator tank circuit. C2 is simply a blocking condenser, and has no other function in the circuit. It may be omitted when no d.c. voltage appears across the tank circuit, as in the present case, but was installed to permit changing the circuit in the experimental layout. With R₅ large compared to the reactance of C_1 , the current through the series circuit R_5C_1 will be practically in phase with the voltage across the tank. The voltage across C_1 , however, will be 90 degrees behind the current, because of the well-known property of a condenser in causing the voltage across it to be in quadrature with the current through it. The r.f. current in the modulator plate circuit will be in phase with the r.f. voltage on the grid, and consequently lags the current through C_1 by 90 degrees. This lagging current is drawn through the oscillator tank, and since causing a 90-degree lagging current is the property of an inductance, the modulator tube simulates an inductance connected in parallel with the tank inductance. The amplitude of the lagging current, and hence the effective value of the inductance, can be varied by changing the amplification through the tube. By varying the current at an a.f. rate, we have frequency modulation. In many circuits the control voltage is applied directly to the control grid through an a.f. filter, but we preferred the isolation given by the No. 3 grid in the 6L7 for the purpose.

With the circuit constants and electrode voltages in the diagrams, a straight-line frequency deviation—No. 3 grid voltage characteristic can be obtained over a range of about plus or minus 2 volts about the operating grid bias of 3.5 volts (obtained from the cathode resistor, R₂). The deviation at 2 volts is 1500 cycles, which, since

the oscillator is operating on 7 Mc., must be multiplied by 16 to give the corresponding deviation at 112 Mc. At the latter frequency, therefore, a peak deviation of about 24 kc. can be secured with negligible distortion.

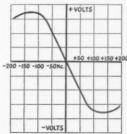


Fig. 6 — The characteristic of the second detector of an f.m. receiver. The vertical axis represents the voltage developed across the load resistor as the frequency varies from the exact resonance frequency.

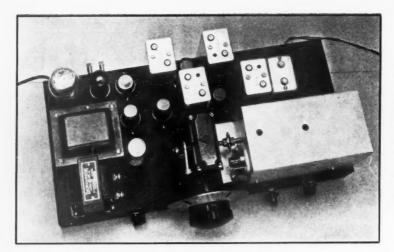
A detector with this characteristic would handle f.m. signals up to a band-width of about 150 kc. (over the linear portion of the curve).

Greater deviation readily can be secured by increasing the L/C ratio in the oscillator tank circuit. As mentioned previously, however, it is desirable to make the circuit as high-C as possible to minimize drift and hum frequency modulation in the oscillator itself. It seems desirable to compromise between these two considerations so that the maximum frequency deviation decided upon is secured when the limits of modulator linearity are reached, a condition which is met in the present case. This requires more modulating voltage, but at the power levels considered this is a small matter, since only 2 peak volts are needed anyhow.

The sensitivity of the modulator (cycles frequency change per volt input) will depend also upon the capacity of C_1 as well as the factors previously mentioned. In our case C_1 , a small isolantite-insulated padder was set practically at its minimum capacity of 3 $\mu\mu$ fd. Larger capacity will reduce the sensitivity, and vice versa. This condenser provides a convenient means of control if the deviation is more than necessary in the first place.

Plate voltage is parallel-fed to the modulator through an r.f. choke as a matter of convenience; parallel feed is not a necessity in the system itself. The 6L7 screen is by-passed both for r.f. and audio, the latter because a change in screen voltage also affects the amplification in the tube and hence its operation as an inductance. It was found by test that a more linear characteristic was obtained when the screen voltage was not allowed to vary.

The other sections of the transmitter control circuit need little comment. With everything on one small chassis, some care must be used to avoid couplings between r.f. and audio sections. The usual care should be taken to prevent hum



The f.m. receiver looks like any conventional u.h.f. superhet. This particular one happens to be made from the front-end portion of the original "S.I.G." receiver and an i.f. amplifier using special 5-Mc. transformers. The power supply is included on the chassis. Controls on the front include audio volume control, i.f. gain control, and a switch to throw the converter into the f.m. receiver or into a conventional receiver tuned to 5 Mc., for comparison purposes.

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in the speech amplifier; in this particular instance we found it profitable to locate the filament wiring so that it was kept as far as possible from the grids of the single-ended tubes used. Hum in the audio system will show up as a "burble" on the c.w. signal from the oscillator when it is monitored on 7 Mc. With the No. 3 grid of the 6L7 shorted to ground the signal should be as clean as the ordinary c.w. signal. By working back towards the front end of the speech amplifier sources of hum readily can be detected and given the proper treatment. So far as the oscillator and buffer are concerned, they differ in no respect from similar e.c.o. rigs, and should be treated accordingly.

Other Methods

Frequency control of the transmitter can be handled in a variety of ways. There is no necessity for starting out on 7 Mc.; as explained before, this happened best to fit in with equipment we already had working. For stabilized transmissions, the usual crystal technique seems desirable, however, and the control unit can be made up to substitute for whatever kind of crystal is used. For instance, the buffer in Fig. 2 might just as well be a doubler to work into a 14-Mc. crystal stage. Or the whole business might be done in relatively few jumps by putting the oscillator on 18.8 Mc., tripling to 56, boosting power a bit and doubling to 112. Tripling and doubling readily can be used in many other combinations, so that relatively few tubes are needed. The 112-Mc. output stage may be either an amplifier or doubler; either works equally well so far as linearity of modulation is concerned. Also, larger buffer and oscillator tubes could be

For amateur work there seems to be no particular need for the extra stabilizing circuit previously described. While this is a necessity for fixed-frequency services where receivers often

are not subject to continuous attention, in an amateur band a small amount of drift is not serious either from a frequency or operating standpoint. As a matter of fact, practice has shown that the drift with a self-controlled oscillator is not at all bothersome, and is practically negligible after a short warm-up.

It should not be difficult to apply frequency modulation directly to a 112-Mc. oscillator, besides the method of generating frequency modulation by means of plate-voltage variation through an amplitude modulator. We shall probably see more of direct modulation in amateur work, but for preliminary experiments it seemed desirable to start out with more readily controlled transmissions.

Receiving Frequency-Modulated Signals

Possibly a bit puzzling at first, the reception of frequency-modulated signals introduces a concept in receivers which, while just as straightforward as with the conventional type, is radically different. First off, as already pointed out, the pass band for an f.m. signal must be anything from 50 to 200 or more kc. wide, depending upon the signal deviation, as compared with the pass band of a receiver for amplitude-modulated signals, which need be only 6 to 20 kc. wide, depending upon the audio-frequency range desired. Contrary to the case of amplitude modulation, the pass band in the wide-band f.m. receiver does not determine the audio range obtained. It does, however, have an effect upon the signal/ noise ratio. In a receiver for amplitude-modulated signals, the signal/noise ratio is better as the pass band is decreased - in the f.m. receiver, the signal/noise ratio is improved as the pass band is increased.

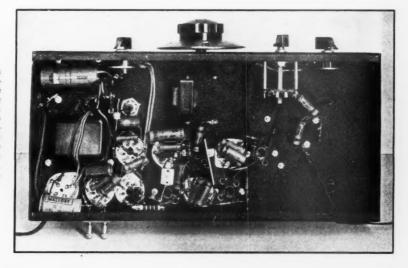
This business of a wide pass band presents no particular difficulties. The front end (r.f., mixer and high-frequency oscillator) of any u.h.f.

superheterodyne is sufficiently broad to pass a band of the necessary width without attenuation, but it is necessary to go to an i.f. of 3 Mc. or higher so that the i.f. circuits will not be too sharp. For amateur purposes, a rather high i.f. is desirable to reduce image response. We decided on 5 Mc. as a suitable i.f. for the receiver shown in the photographs and used for experimental comparisons of frequency and amplitude modulation. Special transformers (Millen) were secured for the purpose through the cooperation of the manufacturer. If images are not a factor, the 3-Mc. Browning frequency-modulation transformers also can be used, with lighter loading than is recommended for broadcast reception to narrow the pass band. In practice, tightly-coupled circuits are used in the i.f. transformers, shunted by resistances of the order of 10,000 ohms further to increase the pass band. It is desirable to have good gain in the i.f. amplifier, and at least two stages should be used.

The signal from the i.f. amplifier is fed into a limiter stage, which is the second point where the receiver differs from the conventional type. The limiter stage is nothing more than an r.f. pentode amplifier working at low plate and screen voltage with grid-leak bias similar to a Class-C amplifier in a transmitter. Since it works at a very low plate and screen voltage (of the order of 5 to 15 volts in this receiver) it takes but little signal to saturate it and make it completely unresponsive to any kind of amplitude modulation, and at the same time it effectively acts as a type of automatic volume control. Obviously, the more gain ahead of the limiter stage the sooner it will reach saturation, which means that a weak signal will work the limiter in an f.m. receiver with adequate gain where it might not if sufficient gain were not available. It is the limiter stage that, once working at saturation, washes out practically all noise of the amplitude-modulated variety (all man-made and most set noise is of this type) and gives the widely-publicized "noise-free" reception. Although washing out amplitude modulation, the limiter will of course pass all frequency modulation.

From the limiter stage, the signal is fed into the second detector, which is quite different from the detector used for amplitude-modulated signals. The circuit is the same as that used in the "discriminator" of automatic-frequency-controlled broadcast receivers. It is shown in Fig. 5, and it can be seen that it appears to be a variety of full-wave rectifier, since opposite ends of the transformer secondary feed the two diode plates. However, the diode cathodes are not connected together but tie across opposite ends of a high resistance, one end of which is grounded. The center-tap of the i.f. transformer secondary is connected to the mid-point of the diode load resistance, through an i.f. choke, to provide a d.c. path for the rectified current. The center-tap is also connected to the "hot" end of the transformer primary through a coupling condenser. Thus the voltage applied to the rectifier network can be considered as consisting of two parts: that contributed by capacity coupling through the condenser and that induced by inductive coupling between the two windings. The voltage fed through by capacity coupling is in phase with the voltage across the primary of the transformer while the voltage induced by inductive coupling is always 180° out of phase with the voltage across the primary. At resonance, the current in the secondary will be in phase with the secondary voltage, since the secondary winding shows only resistance at this frequency, but at frequencies higher and lower than resonance the secondary will show inductive and capacitive reactance, respectively, and the current will lag and lead

A view underneath the chassis of the receiver shows how the by-pass condensers are bunched around the i.f. amplifier sockets, to give short leads and reduce regeneration. The rotary switch is used to switch the converter to another i.f. amplifier, for purposes of comparison.



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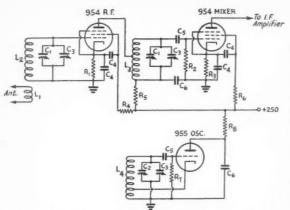


Fig. 7 — The "front end" or converter portion of the receiver. $\begin{array}{l} R_7 -- 50,000 \text{ ohms, } \frac{1}{2}\text{-watt.} \\ R_8 -- 10,000 \text{ ohms, } \frac{1}{2}\text{-watt.} \\ L_1 -- 5 \text{ turns No. } 18 \text{ enam.} \end{array}$

C1 - 3-plate double-spaced midget variable.

C2 - 5-plate double-spaced midget variable.

- 3-30-μμfd. mica trimmer condenser. - 0.01-μfd. 400-volt paper.

-0.0001-µfd. postage stamp mica. -0.001-μfd. postage

stamp mica. - 1500 ohms, ½-watt. - 1 megohm, ½-watt. - 2000 ohms, ½-watt.

- 100,000 ohms, 1/2-watt. - 2000 ohms, 1/2-watt.

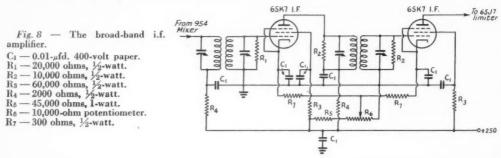
end. A wire from the oscillator grid is run close to the mixer grid, giving enough capacity coupling for mixing.

the voltage. The resultant rectified voltage developed across the load resistor can be drawn as in Fig. 6, which might be considered the detection characteristic of the stage. We see that, at resonance, no voltage is developed across the load resistors, but as the frequency becomes higher than resonance a proportionate negative voltage appears across the resistor, and as the frequency becomes lower than resonance, a proportionate positive voltage appears across the load resistor. Hence the audio output amplitude is proportional to the frequency deviation. For good detection, this characteristic should be linear over the pass band of the i.f. amplifier and symmetrical about the resonance frequency.

The voltage output of the detector is determined by the magnitude of the two types of coupling. In the receiver shown optimum capacity coupling was secured with a coupling condenser of about 30 μμfd., and with rather loose inductive coupling. The maximum points in either direction on the characteristic should be placed just outside the limits of the frequency band occupied by the transmitter, so that no distortion will be introduced in rectification. A wider "spread" between these two points can be used, but maximum audio output will be secured when the signal swings over the whole usable characteristic. The spread is determined principally by the Q of the secondary circuit, which may be adjusted slightly by varying the coupling between the secondary and primary, and also by loading the secondary with resistance. With the transformer used in this receiver, no resistance loading was necessary, since the coupling adjustment gave us sufficient range to permit placing the ends of the characteristic approximately 40 to 50 kc. each side of the center, with only the diodes loading the secondary.

The audio end of the receiver is conventional, and the chief necessity is to design it for adequate fidelity and sufficient power-handling ability. It is advantageous, however, to have fairly high gain, since this will permit full audio out-

put from a relatively small signal from the detector. Although the amplitude of the r.f. signal fed to the rectifier does not vary, once the limiter is functioning, it is obvious that the value of that amplitude can be set by the initial limiting adjustment; that is, the threshold of limiting may be two volts or three volts or whatever one wishes to make it, within reason. The larger the voltage the greater the rectified current, hence the greater the audio output of the detector. By providing sufficient audio gain to make operation from a small rectified signal possible, the limiter threshold may be set quite low, with a resulting improvement in signal/noise ratio on weak signals.



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spaced to 1/2-inch

winding length,

3/8-inch. diam.

- Same as La, with plate tap on middle turn.

-21/2 turns No. 14 spaced

to 5/8-inch winding

length, 5%-inch diameter. Cathode tap

3/4-turn from ground

diam. L2 - 5 turns No. 18 enam.

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Receiver Construction and Alignment

The experimental receiver incorporates the acorn-tube front-end of the original "S.I.G." receiver4 with new coils for 112-Mc. operation. For comparison of the two systems the output of the 954 mixer is fed into either the f.m. i.f. amplifier or into a transformer which can be link-coupled to a conventional receiver tuned to 5 Mc. A switch on the panel permits instant change from one system to the other. This switching system is not shown in the drawings since it is not an essential of the f.m. receiver. The i.f. amplifier consists of two stages of 5-Mc. transformer-coupled 6SK7's, with the plate and grid circuits loaded to give adequate pass bands. The limiter stage is a 6SJ7 with about 8 volts on the plate. A 6H6 second detector feeds a

be set accurately on the frequency for which the i.f. is resonated. This is done by tuning the secondary circuit of the transformer, while the primary tuning chiefly affects the symmetry of the two peaks about the cross-over point. As already mentioned, the spacing of the two peaks can be controlled to a sufficient extent by adjusting the coupling between the coils. The peaks should be set 30 to 50 kc. either side of resonance. The coupling condenser can be set at maximum capacity and probably will need no further adjustment.

A fairly good job of setting the discriminator circuit can be done by ear if the signal generator can be modulated. With the carrier exactly at resonance (on the cross-over point) the audio output from the modulated signal will be almost

Fig. 9 — Audio amplifier and power supply wiring diagram.

R1 - 5000 ohms, 1/2-watt.

 $R_2 = 250,000 \text{ ohms}, \frac{1}{2}$ -watt. $R_3 = 75,000 \text{ ohms}, \frac{1}{2}$ -watt.

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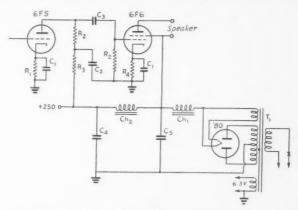
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R₄ — 500 ohms, 1-watt. C₁ — 10-μfd. 25-volt electrolytic.

 $C_2 - 16 \cdot \mu \text{fd}$, 250-volt electrolytic. $C_3 - 0.1 \cdot \mu \text{fd}$, 400-volt paper. C4 — 8-µfd. 450-volt electrolytic. C5 - 25-µfd. 450-volt electrolytic.

Ch₁ — 15-henry 85-ma. choke. Ch₂ — 10-henry 40-ma. choke.

T₁ - 700-volt ct. 90-ma, transformer with 6.3 and 5-volt filament windings.



6SF5 audio which drives the 6F6 audio output tube.

The i.f. and limiter were aligned by using a signal generator for a source and a microammeter for the indicator, cut in between the limiter leak $(R_2 \text{ of Fig. 5})$ and ground. A v.t. voltmeter across the resistor would have served as well, or even a "magic eye" can be used. The i.f. transformers were tuned to 5 Mc. and resistors added across the circuits until the pass band was flat within 1 db (90% of voltage at resonance), 20 kc. either side of 5 Mc., dropping off fairly rapidly after

It is essential that all i.f. circuits be tuned exactly to resonance, the necessary pass band being secured by resistance loading; "stagger" tuning may lead to considerable distortion in the rectified signal.5 The microammeter was then used with a 2-megohm resistor in series as a voltmeter across the diode load resistor $(R_3 + R_3)$ of Fig. 5), and the input transformer to the second detector was tuned so that a characteristic similar to that of Fig. 6 was obtained. The cross-over point (zero voltage as read by the indicating device) should

zero, but as the signal generator is tuned either side of resonance the audio output will increase, becoming greatest at the peaks of the detector characteristic. By careful listening the adjustments for spacing and symmetry can be carried out in just the same way as with a visual indi-

There is nothing difficult about the alignment process, once the principles are understood, if a signal generator (it can be a homemade affair, just so long as it is capable of being varied 100 kc. either side of the i.f. frequency) and a signal indicator (v.t. voltmeter, magic eye, or micro-ammeter) are available. The signal generator should be fairly accurately calibrated in the region about the intermediate frequency, but this presents no problems to those who have calibrated frequency meters from WWV.

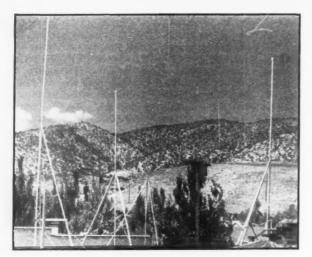
Since a wide pass band is desirable, no regeneration can be tolerated in the i.f. amplifier, and this may require a bit of experimenting with bypass condensers and isolating resistors. It seems to be a good idea to use separate screen by-pass and dropping resistors, as well as plate isolating resistors and separate by-pass condensers. The single-ended tubes require that the cathode by-

(Continued on page 92)

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⁴See Fig. 1120, 1939 Handbook.

⁵ J. R. Day, "A Receiver for Frequency Modulation," Electronics, June, 1939.



The Triangle Antenna

The triangle beam at W6QCC is supported by three simple masts on the roof of the house. The shorter mast in the background supports another antenna.

Selecting Directivity with a Non-Rotatable Beam

BY JAMES ARNOLD, * W6QCC

For the past several months here at W6QCC we have been experimenting with a 20meter antenna system. The array has shown some very definite advantages over the antennas previously used and, while it is not intended to compete with the three- and four-element rotary antennas, it does, we believe, fill a gap between the fixed arrays and the rotaries. We have called it the "triangle array" for obvious reasons.

It is well known that two radiators spaced a half-wave apart and excited in phase show maximum radiation in a line perpendicular to the plane of the radiators. This represents the most elementary form of the broadside array. In case the radiators are excited out of phase the radiation pattern is shifted 90° to form a broad endfire array with maximum radiation in the plane of

Two-element arrays of this type have been used successfully for some time for increasing radiation intensity in definite directions. Reversing switches are sometimes provided to change phase and give either a broadside or end-fire array.1 These two-element arrays are among the simplest and they give effective beams in the directions they are intended to work. The addition of a third element to form the triangle array came as an attempt to increase the flexibility of this simple directive system.

The triangle array consists of three vertical radiators located at the vertices of an equilateral triangle which is a half wavelength on a side. These radiators are operated two at a time, either

in phase or out of phase, the remaining radiator being left open. Using them this way gives six possible operating conditions. And, since the beam is bi-directional, six different operating positions effectively give selection of twelve directions distributed over 360°. This is shown in Fig. 2. In the diagram the radiators are located at E, W and S (for east, west, and south) and EW-i indicates that E and W are operated in phase. SW-o indicates that S and W are operated out of phase, etc. Thus the triangle array constitutes a means of rotating a rather broad beam in steps of 30° merely by antenna selection and phase changing, without the usual mechanical complications. As the radiators are vertical, a large share of the power goes into low-angle radiation where it is most useful. Mechanical requirements are

Fig. 1 — The triangle antenna consists of three vertical elements arranged in a triangle with half-wave-length sides. Phasing is controlled by closing any two switches and leaving the third one open.

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¹ Griffin, "Shifting Antenna Directivity by Phase Shifting," QST, Oct., 1935.

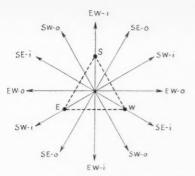


Fig. 2 — Twelve different directions can be obtained from the triangle antenna. For example, radiation along line SE-i is obtained when antennas S and E are operated in phase, while maximum radiation occurs along line SE-o when antennas S and E are operated out of phase.

very simple, since the antennas are fixed and there is no horizontal strain on the masts.

The set-up here at W6QCC is definitely not the most desirable. The radiators are the so-called type "J" antennas which are located on a comparatively flat roof in a triangle 36 feet on a side. The actual radiators are 33 feet long supported on insulators by light masts made of "2 by 2." The quarter-wave matching sections are horizontal and converge to the center of the triangle; twisted drop-cord lines (all of equal length) run from there to the switches located at the transmitter. The matching sections are raised a couple of feet above the roof to keep them out of the snow.

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The selecting switches are mounted on the panel. They are simply d.p.d.t. knife switches connected for reversing and may be left open. The switches are wired so that when two of them are on the same side of center the antennas they feed are in phase and when opposite they are out of phase. The wiring diagram for the entire system is shown in Fig. 1.

Here is another one of those antennas that has its directivity controlled by phasing instead of mechanical means. It only takes three vertical elements and three small knife switches to do the trick.

Link coupling to the tank coil was the most convenient, and no difficulty was encountered in getting the system to take power. The link coil was adjusted until the final stage was properly loaded with radiators connected. Switching the system does not affect the loading or tuning of the final stage.

Results

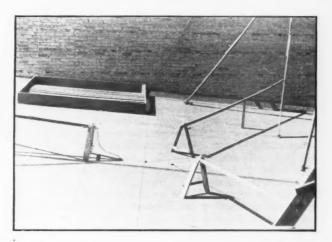
We have obtained quite a number of test reports on the behavior of the array when switched from one position to another. Most stations with whom we have tested report a definite but small difference between the signal strengths on adjacent positions which are 30° apart. When turned two positions (60°) the signal drops 3 or 4 S points and when turned three positions (90°) reports run all the way from "dropped from S7 to S3" to "inaudible."

The use of a volume indicator in the receiver circuit affords a convenient check on the behavior of the system as a receiving antenna. Considering a series of tests that were made over a period of several days, we found that the signal strength dropped 2 or 3 db from the loudest to the nearest adjacent position. Shifting the beam two positions dropped the signal 5 to 7 db while shifting it three positions dropped it 8 to 12 db. The average gain of the loudest position over a single antenna was 5 db by the meter.

Perhaps the most significant test is the fact that, in a hundred odd calls with the new array,

(Continued on page 53)

The quarter-wave matching section at the bottoms of the vertical radiators converge to the center of the triangle, where the low-impedance feed lines are attached.



January 1940

More on the Combined Beat Oscillator and I.F. Amplifier

An Improved Method of Adding C.W. Reception to a Receiver Not Provided with a B.F.O.

BY R. A. McCONNELL,* W8FJ

An article by F. W. Schor in the November, 1938, issue of QST explained a temptingly simple way to permit the reception of c.w. signals on superheterodyne receivers not otherwise equipped with a beat-oscillator. It was suggested that a 6L7 be substituted for the usual 6K7 i.f. amplifier and that the No. 3 grid be used to maintain oscillations at 155 kc., which is the third sub-harmonic of 465 kc. In the process of making such a conversion, the present writer uncovered several circuit considerations and variations, a knowledge of which may prove helpful to anyone who was unable to obtain satisfactory results with the original arrangement.

A first attempt to use the 6L7 showed a striking loss in receiver sensitivity, even when the coupling resistor R_1 (Fig. 1-A) was made so small that the b.f.o. was not in oscillation. This sensitivity loss was greater than could be expected from either the supply or signal voltage drop in R_1 . The explanation proved to be a simple one, namely, degeneration at the i.f. frequency due to the coupling of the plate to the No. 3 grid. Schor's circuit is redrawn in Fig. 1-A in such a way as to make conventionally evident the high-pass action of the oscillator tank circuit. The mutual inductance of the two parts of L_1 is not shown in Fig. 1-A because it is ineffective at the i.f. frequency at which degeneration takes place.

The final circuit adopted, shown in Fig. 1-B, prevents this degeneration by using a Colpitts oscillator. This arrangement has the added advantage that the rotor of C_1 may be grounded and that the somewhat critical feedback may be easily adjusted by changing C_5 , rather than by shifting a coil tap. To maintain the frequency at 155 kc., any adjustment of C_5 will require a much smaller percentage adjustment in C_1 or C_4 . Since the change in C_1 required to set the b.f.o. to any desired audio pitch is very small, the feedback is essentially constant throughout the operating range of C_1 . Thus, because the feedback is dependent on the ratio of C_{\bullet} to $(C_1 + C_{\bullet})$, whereas the frequency of oscillation is a function of the capacitance of C_5 in series with $(C_1 + C_4)$, the adjustments of feedback and frequency are relatively independent of one another when the values are as shown.

It is generally assumed that for satisfactory operation on c.w. signals some sort of separate manual sensitivity control must be substituted for the a.g.c. In the conversion of an all-wave b.c. receiver for communications use, such substitution proved to be an unwelcome complication. There are three reasons why an r.f. sensitivity control ordinarily replaces a.g.c. First is the fact that the b.f.o. output is generally not adjustable and, while the b.f.o. is made to oscillate weakly so as to be near the point at which the diode shifts from square-law to linear detection,1 its output is still great enough as to actuate the a.g.c. and prevent reception of the weakest signals. This difficulty is sometimes avoided by the use of so-called "delayed" a.g.c. A second reason appears when the desired c.w. signal is relatively strong, in which case the a.g.c. action both changes the receiver transient response and causes a high noise background. These effects make the signal difficult to copy. A third reason is found when the desired signal is relatively weak in the presence of a strong interfering signal. When a.g.c. is retained, the changes in sensitivity caused by the keyed interfering signal confuse the listener and prevent achieving the theoretically desirable condition 1 that the b.f.o. signal be no stronger than the desired signal. The first two of these reasons for substituting a separate manual sensitivity control for the a.g.c. are successfully negated by the device of making the b.f.o. output controllable over a wide range. This is accomplished by making R_1 variable, as in Fig. 1-B. There is thus available a weakly oscillating b.f.o. for the reception of weak signals at full receiver sensitivity, or a strong b.f.o. signal

It's easy to add c.w. reception to a superhet which has no b.f.o., by using this system which overcomes a disadvantage of the one previously described. for

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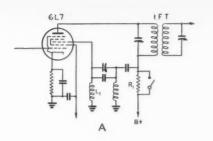
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¹ It has been pointed out by F. E. Terman, *Electronict*. Nov., 1930, that it is peculiar to the linear detection of heterodyne signals that the difference-frequency output depends almost entirely upon the strength of the weaker of the two signals involved. The usual diode second-detector is a linear detector for all but small signal values.

^{* 151} Center Avenue, Emsworth, Pa.



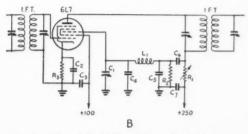


Fig. 1 — The original (A) and the revised (B) circuits for the combined b.f.o. and i.f. amplifier.

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– 0.1-µfd. 200-volt paper. – 0.05-µfd. 200-volt paper.

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C₄ - 550-μμfd. mica, subject to slight modification.

C5 - 0.01- to 0.002-µfd. mica.

C₆ — 0.01-µfd. 400-volt mica. C₇ — 0.25-µfd. 400-volt paper.

C₇ = 0.25 μ₀ 1. 300-ohm wire-wound potentiometer.
 R₁ = 5000- or 8000-ohm wire-wound potentiometer.
 R₂ = 25,000 to 250,000 ohms, ½-watt.
 R₃ = 300 ohms, ½-watt.
 L₁ = 2.5-μh. r.f. choke (National R-100).

for the reception of strong signals at reduced sensitivity. The third objection to the retention of a.g.c. remains, but experience shows that this is of less practical importance than the first two. When an r.f. gain control and a.g.c. switch can be installed, the advantages to having R_1 variable largely disappear. If R_1 is not made variable, a switch to permit telephone reception must be installed, as in Fig. 1-A.

There are a number of minor points to be observed in adjusting the beat-oscillator. A.g.c. voltage must be removed from the grid of this i.f. stage, if present, otherwise the b.f.o. would limit its own output so that R_1 would not control the a.g.c. voltage as desired. Furthermore, loud signals would reduce the mutual-conductance of the 6L7 and stop the oscillator completely. If a.g.c. voltage is applied to a pentagrid-converter firstdetector, it may be found that strong signals will chirp slightly until the b.f.o. is turned up. When C₅ and R₃ have been properly adjusted, the b.f.o. will slip smoothly into oscillation when R_1 is at perhaps 1000 ohms. The oscillations will be so weak as to have no appreciable effect upon the a.g.c. circuit. As R_1 is turned to maximum, the third harmonic b.f.o. output will increase continuously to a point where none but the loudest local signals will affect the a.g.c. voltage. A 6E5 magic-eye connected for maximum sensitivity, or a d.c. v.t. voltmeter, will provide a rapid check of this adjustment. C5 should be as large as possible. Its exact value will depend upon the value of R₃, upon the plate and screen voltages, and upon the design of the plate i.f. transformer. In the present case a value of 0.01 µfd. was used when R_3 was made 300 ohms. R_2 is important both as a load on the b.f.o. and as a grid leak. In the writer's experience it was necessary to adjust it to within 10% of the optimum value. For further suggestions the reader is referred to Schor's original article.

Who Can Work Most States on U.H.F. in 1940?



AWARDS! Yes, there's a question to be decided. What enterprising amateur operator using any u.h.f. bands will work most states (of the 48 United States) from the beginning to the very end of 1940? Three suitably inscribed solidbronze medallions, engraved with the call of the winner and the number of states he works ex-

clusively on u.h.f. in this coming year, will be awarded by A.R.R.L. All work credited must be that from one location, with the transmitter on 56-60-, 112-116-, or above 224-Mc. amateur bands.

A location is defined as "from places in one community, no two of which are more than 25 miles apart." The District of Columbia counts for Maryland as it was part of that state once.

Required: Written confirmations from the stations contacted, one such confirmation for each state claimed. Report new states at once, but hold confirmation cards and letters until the end of the year, when the leading operators must submit evidence to support claims, including (please) postage sufficient for the return of any such communications desired returned. All u.h.f. amateurs working for this should report their number of states (and progress) with their Marathon scores, from month to month, for QST mention. Monthly progress tables will appear from time to time. See that your call is there!

How many States can you work on u.h.f. in

* WHAT THE LEAGUE IS DOING *

SPECIAL ELECTION NOTICE

To all A.R.R.L. members of the West Gulf Division:

You are hereby notified that a special election is about to be held in the West Gulf Division to elect an alternate director to fill the vacancy left by the death of W. H. Burt, W5BRC. The election will be for the unexpired remainder of the 1939–1940 term, plus the next regular term of two years, 1941–1942, as provided in By-Law 24.

If more than one eligible candidate is named, voting will take place during the month of March, 1940, on ballots that will be mailed from the headquarters office in late February.

Nomination is by petition. Nominating petitions are hereby solicited. Your attention is invited to the pertinent portions of the Constitution and By-Laws of the League, a copy of which will be mailed any member upon request. Ten or more A.R.R.L. members residing in the West Gulf Division may join in nominating any eligible West Gulf member of the League as a candidate. The following form is suggested:

Executive Committee

The American Radio Relay League West Hartford, Conn.

lowing full term of 1941-1942.
(Signatures and addresses)

The signers must be League members in good standing. The nominee must have been both a member of the League and a licensed radio amateur operator for a continuous term of at least four years immediately preceding receipt by the Secretary of his petition of nomination, except that a lapse of not to exceed ninety days in the renewal of the operator's license and a lapse of not to exceed thirty days in the renewal of membership in the League, at any expiration of either during the four-year period, will not disqualify the candidate. He must be without commercial radio connections: he may not be commercially engaged in the manufacture, selling or renting of radio apparatus normally capable of being used in radio communication or experimentation, nor commercially engaged in the publication of radio literature intended, in whole or part, for consumption by licensed radio amateurs. Further

details concerning eligibility are given in By-Law 12. His complete name and address, and call, should be stated. All petitions must be filed at the headquarters office of the League in West Hartford, Conn., by noon E.S.T. of the 20th day of February, 1940. No member shall append his signature to more than one petition. To be valid, a petition must have the signatures of at least ten members in good standing. Petitioners are urged to have an ample number of signatures, since nominators are frequently found not to be members in good standing.

Balloting will close at noon, April 1, 1940, and the successful candidate will take office as soon as

the result can be determined.

All the powers of the division director are transferred to the alternate director in the event of the director's death or inability to perform his duties. This election therefore constitutes an important part of the machinery of self-government in A.R.R.L., and members are urged to take the initiative and file nominating petitions immediately.

For the Board of Directors:

K. B. WARNER, Secretary fo

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November 13, 1939

"DUPLEX" ABOVE 112

You may now operate "duplex" on frequencies above 112 Mc. It will be remembered that there is an F.C.C. reg stating that, except for brief tests or adjustments, 'phone stations shall not emit a carrier wave unless modulated for the purpose of communication. Last May the A.R.R.L. Board requested F.C.C. to relax this restriction as concerns the u.h.f. above 112 Mc., and in late November the Commission amended Sec. 152.43 so that the rule does not apply to $2\frac{1}{2}$, $1\frac{1}{2}$ and below 1 meter. We're free now, but let us be considerate of each other and not abuse the privilege.

At the same time, the Commission made belated corrections in our regulations to specify the upper frequency limit of the 2½-meter band as 116 Mc. A little flurry of excitement was caused in amateur ranks by the Commission's publication of the five amended rules which, because they quoted only those that had been corrected, created the impression in some quarters that our Class A 'phone bands had been deleted! This of course was not the case and the rule which deals with the Class A bands was not mentioned because no change was made in it. The 'phone

bands are the same as ever.

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SANTIAGO CONFERENCE

By the time these lines are read, the United States will have completed its preparation for the second inter-American radio conference and shortly before the end of the year its delegation will sail for Santiago de Chile, where the meeting opens in middle January. The United States of course continues to support the assignment of all U. S. amateur bands as exclusively amateur throughout the American, and it is expected that all the American administrations will join in embracing this traditional point of view. There is nothing else very exciting on the agenda from the amateur point of view. A.R.R.L. expects to be represented by Segal and Warner.

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For your new A.R.R.L. Handbook? We thought you might be interested in knowing that in the first week of its appearance, something over 25 tons of the new Handbooks moved through the A.R.R.L. shipping room on their way to individual purchasers and dealers. And that in the preparation of the new edition, six members of QST's editorial staff put in about a thousand hours of overtime work in three months. Have they been a busy bunch! Everybody says it's the finest job we've ever turned out, so we're feeling happy.

WIINF, the station of the Headquarters Operators Club, is on the air on 5 and $2\frac{1}{2}$ with a neat little 200-watt station in the penthouse atop A.R.R.L. headquarters. The antenna is a vertical coaxial about 60 feet high. It is in this station that the frequency-modulation apparatus described in this issue is receiving its work-out.

If there are any K7 amateurs who do not know it: The postmasters of Alaska are now authorized to administer oaths and affirmations and to take acknowledgments — which may help in some amateur applications.

"PATRIOTS ON SHORT WAVE"

UNDER the above title, the Chicago Daily News printed the following editorial in late October, which we think will interest League members:

The Federal Communications Commission's prompt squelching of the suggestion that our neutrality might be in danger of violation through illegal traffic in short-wave radio messages should settle all doubts upon that score. As the commission points out, its rules forbid operation of short-wave equipment to all but American citizens, and these operators are banded together in organizations such as the American Radio Relay League, which do their own policing and are constantly on the alert to report unfamiliar messages, in secret code or otherwise, to the authorities at Washington.

Moreover, anyone familiar with the breed can testify that these "hams," as the amateurs delight to call themselves. are as ardently patriotic a group as can be found in American life. Most of us are familiar with the record of their splendid services in times of civil emergency and natural upheaval, such as floods, fires and storms. What the general public is less likely to appreciate is the fact that their coördinated

services have put them in position to prove, if the necessity ever arises, just as valuable in a military as in a civil emergency. In every state, members of the great "ham" family are tied in very directly with National Guard units and Army and Naval reservists. Many hold reserve signal corps commissions, and plans for M-Day are nearly always based to some extent upon communication provided by short-wave stations.

So wideflung is the ham network, so continuous its operation and so devoted the patriotism of the men who man it at all hours and in the remotest sections, that the possibility of espionage communication or transmission of subversive propaganda via short wave, without the consent of the government, seems wholly negligible.

Bound Volume XXIII of 'QST'

We have a limited number of Bound Volume XXIII of QST. This volume is made up in two sections, each containing six issues of 1939 QST. Handsomely bound and gold imprinted the complete volume is priced at \$7.50, postpaid.

WWV Schedules

EXCEPT for the special broadcasts of WWV using 20 kw. as described below, WWV is now running a continuous schedule (day and night) on 5000 kc. with a power output of 1 kw. This continuous transmission is modulated with the standard pitch in music, 440 cycles per second.

Each Tuesday, Wednesday and Friday (except legal holidays), the National Bureau of Standards station, WWV, transmits with a power of 20 kw. on three carrier frequencies as follows: 10:00 to 11:30 a.m., E.S.T., on 5000 kc.; noon to 1:30 p.m., E.S.T., on 10,000 kc.; 2:00 to 3:30 p.m., E.S.T., on 20,000 kc. The Tuesday and Friday transmissions are unmodulated c.w. except for 1-second standard-time intervals consisting of short pulses with 1000-cycle modulation. On the Wednesday transmissions, the carrier is modulated 30% with a standard audio frequency of 1000 c.p.s. The accuracy of the frequencies of the WWV transmissions is better than 1 part in 5,000,000.

EXPERIENCE SPEAKS

A VERY handy cleaning tool for radio apparatus is the ordinary pipe cleaner. It is especially useful in cleaning out socket prongs, variable-condenser plates, switch contacts and other hard-to-get-at parts. Alcohol is a good solvent for rosin. Dip one end of the cleaner in cleaning solution and use the other end for wiping dry. Dirty isolantite sockets can be made to look like new without dismounting.

A.R.R.L. Announces U.H.F. Marathon for 1940

BY F. E. HANDY, WIBDI

RULES

- 1. The Contest is open to all licensed radio amateurs.
- Operating and experimental work taking place during the year 1940, and reported to A.R.R.L. shall count points toward awards.
- 3. Contacts may be scored for each completed QSO with a station, points claimed depending on distances ² measured by a great circle line between stations, as follows:

1 point
2 points
5 points
25 points
10 points
50 points

Scoring 56-60 Mc. points follows the above tabulation. Two times these point credits may be obtained for 112-116-Mc. band contacts, and ten times the basic credit for contacts reported using the frequencies above 224 Mc. assigned by the F.C.C. to amateurs.

4. In computing the point score, a competitor may claim points for each different station worked but once on a particular band, for the entire year. Monthly additions to credits will boost the score

standing, and claim toward the 1940 U.H.F. ACHIEVEMENT Certificate. The same station may be worked on other of the u.h.f. bands mentioned above, for additional appropriate credit therefor. (Portable or portable-mobile work with this same station may be substituted in a list for its fixed station credit in a given band, if the distance is greater. A portable or portable-mobile equipment may be used by the competitor himself, and when duly controlled and operated by this competitor, points so attained with stations not appearing in the fixed-station portion of the particular score, will be granted. This is to say that a call signal is regarded as indicating a single station identity, whether operated in fixed or portable-mobile status. All points claimed must be those attained by an individual amateur operator himself, operating equipment under his own call only.)

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5. Monthly claims must be made in the form of a "stations worked" list, indicating distances and points for the stations shown with the claimed total for a given calendar month. The frequency band of your transmitter shall determine the multiplier of 1, 2, or 10 applicable to particular contacts and allows cross band work to count. Monthly claims must be sent at once, following the end of a calendar month. To be considered for the certificate given for that month, and to be reported in the u.h.f. section in QST, or to count toward annual awards, reports for each month must bear a postmark not later than the tenth of the following month. (1940 U.H.F. Award for Section winners for the year's work on all u.h.f. and the bronze medallions to be engraved to credit highest communication credits in each separate u.h.f. band mentioned, will be determined for the Marathon after Feb. 1, 1941, based on participant's summary and mailed-on-time monthly reports in substantiation.)

6. Proof of contact in writing from any stations contacted may be required as prerequisite to credit, whenever thought necessary by the

* Communications Manager, A.R.R.L.

¹ See list of field organization Sections in the front of this QST.

² Normal u.h.f. work is generously credited for the marathon, points depending on distances involved, which depends on the careful adjustment of u.h.f. gear, on the antenna design, and operating ability. The liberal credits (1 and 2 points) for distances up to 76 miles enables every operator of u.h.f. gear to report a score on the u.h.f. bands!

erator of u.h.f. gear to report a score on the u.h.f. bands! Work up to 250 miles is harder, and 250-500 miles much harder, than that at lesser distances. The credit goes up appropriately to a value that will represent a return for the pains taken to assemble good apparatus, and the time used in research and testing to work the instances involved. For work 500-1500 miles, dependent on unusual refractions, freak and short-term conditions apply, with less credit (10) to efforts and efficiency than to good luck, and chance equal to all. For over 1500 miles, extra recognition is given for a rare feat, with sufficient written documentation to contribute to knowledge and frequency of occurrence of rare "skip-DX."

Radio Contacts Jan. 1, 1940–Dec. 31, 1940, to Determine Standings Reported Monthly in QST — 1, 2, or 10 Multiplier Applies (respectively) to Points Claimed for your 56-, 112-, or 224–Mc.-and-above Frequency Band Contacts — High Monthly Scorer to Get Certificate Award — Special Certificate to U.H.F. Marathon Winner for Each A.R.R.L. Section 1 at Year-End — Leading Operator Claim for Each of Three (above) U.H.F. Band Groups also to Get a Medallion Award.

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award committee of A.R.R.L.-QST staff members, and will be expected always on contact claims exceeding 500 miles.

7. Extra credit, in no case to exceed 10%, may be granted participants for reported technical achievements, submitted articles in the u.h.f. field, intelligent observation of unusual conditions, photos, etc. such to count toward marathon awards only if these items are summarized and brought to the attention of the Committee toward the end of the marathon, preferably attached to the twelfth or last monthly contact report, and 12-month summary of claims. Operating utilization of the u.h.f. bands will be the important determinant of the winners. All those overlooking no possible credit will take the opportunity (equal to all) to add this possible fixed credit to their general standing for the year.

AWARDS

Monthly certificates, and the special 1940 Marathon certificate awards to each Section high scorer, will be signed by the three members of this award committee, the technical editor, the contributing editor, u.h.f., and the communications manager. These are beautiful, lithographed, full 8½ by 11 inch certificates, for the (1) monthly leader³ in points (2) the highest u.h.f. scorer for the year, in each A.R.R.L. Section. The three medallion awards are to be suitably engraved bronze charms, bearing the calls of leaders considering only the work for a particular u.h.f. band. If there are fewer than three entries in any band classification the committee reserves the right to declare "no award" or if there are ties, duplicate awards will be granted. W1HDQ, WIAW, WIINF and other operator work of staff-member stations may be recorded but all such operators will be ineligible for this or other A.R.R.L. u.h.f. awards.

REPORTING

Starting January first, the U.H.F. Marathon will be in progress for one year. *QST* will show monthly standings of all reporting amateurs. It

1"The monthly leader" is the person showing most points, or greatest progress for a calendar month in question, without respect to the cumulative marathon-standing.

is not necessary to be a League member to take full part. Just do some u.h.f. operating and report (worked lists with claimed points, first of each month) and your chances will be excellent. Address all reports to A.R.R.L. Communications Department, West Hartford, Conn.

* A.R.R.L. QSL BUREAU

For the convenience of its members, the League maintains a QSL-card forwarding system which operates through volunteer "District QSL Managers" in each of the nine United States and five Canadian districts. In order to secure such foreign cards as may be received for you, send your district manager a standard No. 10 stamped envelope. If you have reason to expect a considerable number of cards, put on an extra stamp so that it has a total of six-cents postage. Your own name and address go in the customary place on the face, and your station call should be printed prominently in the upper left-hand corner.

W1 — J. T. Steiger, W1BGY, 35 Call Street, Willimansett, Mass.

W2 — H. W. Yahnel, W2SN, Lake Ave., Helmetta, N. J.

W3 — Maurice Downs, W3WU, 1311 Sheridan St., N. W., Washington, D. C.

W4 — G. W. Hoke, W4DYB, 328 Mell Ave., N. E., Atlanta, Ga.

W5 — James F. Manship, W5ALE, 910 So. Boston, Tulsa, Okla.

W6 — Horace Greer, W6TI, 414 Fairmount Ave., Oakland, Calif.

W7 — Frank E. Pratt, W7DXZ, 5023 So. Ferry St., Tacoma, Wash.

 W8 — F. W. Allen, W8GER, 324 Richmond Ave., Dayton, Ohio.
 W9 — Alva A. Smith, W9DMA, 238 East Main

St., Caledonia, Minn. VE1 — L. J. Fader, VE1FQ, 125 Henry St.,

VE2 — C. W. Skarstedt, VE2DR, 236 Elm Ave.,

Westmount, P. Q. VE3 — Bert Knowles, VE3QB, Lanark, Ont. VE4 — George Behrends, VE4RO, 186 Oakdean

Blvd., St. James, Winnipeg, Manitoba. VE5 — H. R. Hough, VE5HR, 1785 First St., Victoria, B. C.

K4 — F. McCown, K4RJ, Family Court 7, Santurce, Puerto Rico.

K5 — Norman F. Miller, K5AF, 15th Air Base Squadron, Albrook Field, Canal Zone.

K6 — James F. Pa, K6LBH, 1416D Lunalilo St., Honolulu, T. H.

K7 — Jerry McKinley, K7GSC, Box 1533, Juneau, Alaska.

KA — George L. Rickard, KA1GR, P. O. Box 849, Manila, P. I.

Regeneration in the Preselector

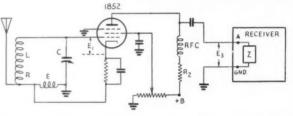
Theoretical Investigation of the Possibilities of Image Rejection and Gain

BY G. H. BROWNING*

It is generally appreciated in amateur circles that efficient preselection is advantageous from the standpoint of image rejection, gain, and increased signal-to-incoming noise ratio. Some time ago the writer had occasion to examine possibilities of several types of preselection circuits both from a mathematical and a practical standpoint. It is believed that data collected during this examination may be of general interest and will therefore be presented in the discussion which follows.

tuned circuit will have a reasonably constant Q over a considerable frequency spectrum because as the frequency is increased, the radio-frequency resistance of the coil increases in about the same proportion.) Under controlled laboratory conditions with very stable circuit components and constant temperature for these circuits, it was found that the original Q of a tuned circuit could be increased more than five hundred times so that, if a tuned circuit originally had a Q of, for instance, 100, the resulting effective Q with resolved

Fig. 2 — Regenerative preselector circuit considered in the text.



At least two straightforward and practical systems of obtaining image rejection, additional gain, and increase in signal-to-noise ratio are possible. The first system would consist of regeneration in a high-Q tuned antenna system while the second would consist of a stage or two of radio-frequency amplification without regenera-

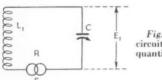


Fig. 1 — The resonant circuit and fundamental quantities.

tion. A third system might combine the two previous methods and, from a theoretical angle, is entirely possible. However, so many difficulties are encountered in practice that this system might be ruled out because of the problem of tracking or the additional controls required.

Some years ago, work was done at Cruft Laboratory, Harvard University, on the subject of regeneration as applied to a tuned circuit to increase its Q. (The Q of a tuned circuit is the ratio of inductive reactance in the tuned circuit to the radio-frequency resistance; a well-designed

* Browning Laboratories, Winchester, Mass.

generation could be made of the order of fifty thousand with a fair degree of stability, and that the value to which Q could be increased seemed to be somewhat independent of the original value provided very small signals were employed. Practical experiments conducted under non-controlled conditions but using as stable circuit constants as are available at the present time indicate that the Q of a tuned circuit which was originally about 100 could be increased by regeneration to have an effective Q of from 1000 to 5000. By careful manipulation with an 1852 tube, even higher values can be obtained without the circuits breaking into oscillation. In this article, it will be assumed that the practical limit is between 1000 and 5000. For comparison purposes it might be pointed out that the Q of resonant lines is about 10,000 or more while the Q of an X-cut crystal is 25,000 or more.

Let us first examine mathematically the voltage developed across a tuned circuit when an electromotive force is impressed in series, as shown in Fig. 1.

Let

E = series e.m.f.

L =inductance of the coil in henrys.

C =capacitance of the condenser in farads.

R = total radio frequency circuit resistance due to losses in the inductance and capacitance, expressed in ohms. ma

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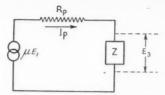


Fig. 3 — The equivalent circuit of an amplifier tube and load.

I = current in amperes flowing in the tuned circuit.

 $\omega = 2\pi$ times the frequency in cycles per second.

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$$I = \frac{E}{\sqrt{R^2 + \left(\omega L - \frac{I}{\omega C}\right)^2}},\tag{1}$$

When the circuit is tuned to resonance

$$\omega L = \frac{1}{\omega C}$$
 and
$$I = \frac{E}{R}.$$
 (2)

The very approximate voltage developed across the tuned circuit under these conditions is

$$E_1 = \omega L I. \tag{3}$$

Substituting in equation (3) the value of I given in equation (2), we obtain

$$E_1 = E \frac{\omega L}{R}.$$
 (4)

The voltage ratio or gain is equal to

$$\frac{E_1}{E} = \frac{\omega L}{R}.$$
 (5)

But

$$Q = \frac{\omega L}{R}$$
.

Therefore

$$\frac{E_1}{E} = Q. (6$$

As previously pointed out, a well-designed circuit may have values of Q from 100 to 300 and this value is reasonably constant over a considerable range of frequency.

Now regeneration applied to the tuned circuit may be considered as lowering the effective radio frequency resistance R and consequently increasing the value of Q.

Therefore we see that if, by means of regeneration, Q has values of from 1000 to 5000, the voltage which may be impressed upon the grid-cathode circuit of a tube is 1000 to 5000 times the voltage developed in series due to the incoming signal from the antenna. This statement is only true for signals of very small magnitude, because there is of course a limit to the maximum signal amplitude which can be obtained.

Regenerative Preselection

Let us examine means of obtaining regeneration and at the same time coupling the signal from the tuned circuit to the input of the radio receiver. The essential parts of such a circuit are shown schematically in Fig. 2. The signal fed from the antenna flows through a few turns of wire to ground, developing a voltage E in series with the tuned circuit. The voltage E_1 is developed across the tuned circuit and is impressed between grid and cathode of the 1852 tube. Regeneration is obtained by feedback from the plate, the amount of feedback being controlled by a variation of screen d.c. voltage. Now the quantity that we are particularly interested in is the ratio E_3/E ; for, assuming that when the antenna is switched to the receiver (point A) without the preselection stage, the voltage developed across the input of the set would be the same as that developed in the tuned circuit (E), this ratio E_3/E would give the total gain due to the preselection stage.

To evaluate this quantity, it is necessary to calculate the gain due to the tube itself or the ratio of E_3/E_1 .

The equivalent circuit of a tube used as an amplifier is shown in Fig. 3. Z, the input impedance in the average receiver, might be about 400 ohms at frequencies from 2 to 14 Mc., and as this is much smaller than the impedance of RFC plus R_2 , it will be considered as the plate circuit load. R_p is the plate resistance of the 1852 tube, or approximately 750,000 ohms. μ is the amplification factor. Now as the load impedance of 400

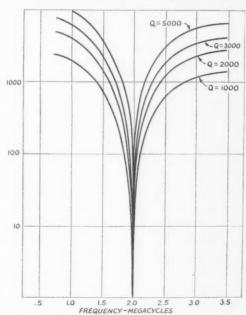


Fig. 4 — Resonance curves for circuits tuned to 2.0 Mc., and having circuit Q's from 1000 to 5000.

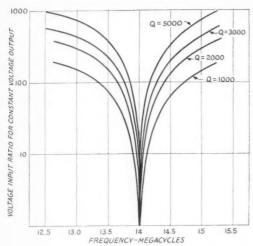


Fig. 5 — Resonance curves for circuits tuned to 14.0 Mc., with Q's from 1000 to 5000.

ohms is entirely negligible (regardless of its phase angle) compared to 750,000 ohms, the radio-frequency current flowing in the circuit is

$$I_p = \frac{\mu E_1}{R_p} \tag{7}$$

and

$$E_3 = ZI_p = \frac{\mu E_1 Z}{R_p}. (8)$$

 μ/R_p is the transconductance G_m which, in the case of the 1852 will be at least 6000 micromhos. Substituting this in equation (8) gives

$$\frac{E_3}{E_1} = G_m Z. (9)$$

Substituting the numerical values, we find that $E_3/E_1 = 2.4$. From previous calculations E_1/E_1 =1000 to 5000. Consequently, the overall gain of the stage is $E_3/E_1 = 2400$ to 12,000 times, according to the regeneration used. Thus, it is seen that a very large gain can be obtained with a regenerative stage if the circuit components are stable and allow smooth control of regeneration. Let us now examine the shape of the resulting resonance curves to determine the image rejection ratios which are possible. Two such resonance curves are plotted in Figs. 4 and 5 with values of Q from 1000 to 5000. All of these curves show the input voltage ratio for a constant voltage output at various frequencies close to the resonant frequency. In Figs. 4 and 5 the resonant frequencies are 2 and 14 Mc.

The image frequency is always twice the i.f. in the superheterodyne. Usually the image frequency is on the high-frequency side of the signal frequency. (This is the case if the oscillator in the receiver is higher in frequency than the resonant frequencies of the antenna and r.f. tuned circuits.) It will be noted that the resonance curves are not symmetrical, and in determining image rejection ratios, it will be assumed that the image is on the high-frequency side of the signal. Therefore, if the receiver has an i.f. of 465 kc. and is tuned to 2.0 Mc., the image rejection ratio with a Q of 1000 is approximately 1000 and with a Q of 5000 is approximately 5400. If the image was on the low-frequency side of the signal even greater rejection would be obtained.

At 14 Mc., assuming the same i.f., the image rejection ratio is 130 with a Q of 1000 and 690 with a Q of 5000.

Laboratory tests indicate that the theoretical gain and image rejection could be obtained in practice if extremely weak signals were impressed on the antenna. The tests also reveal that a large amount of care in adjusting the regeneration was necessary if maximum performance was to be obtained.

Non-Regenerative Preselection

Let us now consider the possibilities of preselection consisting of a stage of r.f. amplification working into a coupling tube which in turn connects to the receiver, such as shown in Fig. 6. In the case of an r.f. pentode where the plate resistance is high compared to the load in the plate circuit, it can be shown that at resonance (maximum gain) the gain due to the tube and r.f. transformer is expressed by

stage gain =
$$\frac{E_2}{E_1} = G_m Q_2 k \sqrt{\frac{\overline{L_1}}{C_2}}$$
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where E_1 is the a.c. voltage impressed on the grid of the tube and E_2 is the voltage developed across the tuned r.f. transformer.

 $G_{\rm m} = {\rm transconductance}$ of the r.f. tube

$$Q_2 = \frac{\omega L_2}{R_2}$$

 $Q_2=rac{\omega L_2}{R_2}$ k= coefficient of coupling between L_1 and

 L_1 = the inductance of the primary of the r.f. transformer

 C_2 = capacitance of the condenser.

At 14 Mc. the constants might be somewhat as follows:

 $G_{\rm m}$ for 1852 tube = 6000 micromhos

 $Q_2 = 40$

k = 0.3 $L_1 = 0.5 \times 10^{-6} \text{ henrys}$ $C_2 = 100 \times 10^{-12}$

Placing these values in equation (10) we find that the stage gain is about 5. This value must be multiplied by the value of E_1/E (the gain in the tuned antenna circuit) and by E_3/E_2 (the gain in the coupling tube). If the antenna circuit has a Q of 40, $E_1/E = 40$. If the 1852 is used as a coupling tube and Z = 400 ohms, $E_3/E_2 = 2.4$ (as per previous calculations). Consequently the total gain of the system E_3/E is 480.

Thus it would appear that regeneration in the

tuned antenna circuit is capable of producing greater gain and image rejection than could be obtained from a stage of r.f. amplification. From the standpoint of signal-to-incoming noise ratio, regeneration in the antenna stage has a considerable advantage.

At 5 and 10 meters, regeneration in the antenna stage apparently is still superior to the stage of r.f. Any measurements or mathematical predictions concerning these frequencies would probably be of a controversial nature and have been omitted.

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Signal-to-Noise Ratio

So far as the writer knows, there is no method of readily computing the increase in signal-tonoise ratio as the Q of the tuned antenna system is increased, though it is generally appreciated that as the band width in a tuned circuit decreases, the noise passed through the tuned circuit will decrease. As there may be misunderstandings arising from the term "signal-tonoise" ratio which is sometimes applied to the noise generated in the tubes themselves, the writer wishes to point out that the noise which is being considered is man-made interference, atmospherics, etc., entering the set through the antenna system, not that generated in the set itself due to "shot" effect and other analogous conditions. In operating a preselector close to the point of oscillation with a very high effective Q, a marked decrease in noise was obtained. In fact, the effect was so pronounced that reception was greatly improved. To verify this effect by experimental data the following set-up was made: A regenerative preselector was connected to an all-wave receiver. The signal output lead from the preselector was shielded to the antenna of the receiver with a low-capacity shield. The receiver was completely shielded with no exposed parts whatsoever which could pick up signals. In fact, the lead carrying the signal from the preselector was shielded completely to the antenna coil. The preselector was also completely shielded. The 110-volt line which fed the preselector and receiver was filtered in two places. Every precaution was taken so that all noise or signal entering the system would be picked up on the antenna and not on the 110-volt leads or the set leads.

Some little experimentation was carried on to find a noise-making device which would have

sufficiently constant noise output so that it could be measured fairly accurately on a critically damped db meter which was connected to the output of the receiver. It was found that a small universal motor served the purpose admirably while electric razors and other apparatus tried out were considerably more erratic in their performance. The universal motor was placed underneath the receiving antenna in the yard with about a 60-foot a.c. line running to it. This a.c. line was also filtered. With the universal motor running and no antenna connected to the receiver, no pick-up was obtained. When the antenna change-over switch on the preselector connected the preselector ahead of the receiver, the exposed antenna binding post on the preselector picked up a slight amount of noise from the universal motor. However, it was found by shielding this binding post that no pick-up was obtained. Thus it was felt that all the noise and the signal entering the preselector and receiver combination would be through the antenna system.

To obtain a constant measurable signal a second short antenna, paralleling the regular antenna, was attached to an all-wave signal generator. The results obtained with this set-up are as follows:

Results obtained at 19 Mc. - The signal generator was set so that when the antenna throwover switch of the preselector connected the antenna directly to the receiver (volume control advanced to maximum sensitivity) the output meter read -4 db. When the antenna throwover switch was operated so that the preselector was connected ahead of the receiver, the signal strength increased to +35 db. The tube hiss is also increased to some degree. The signal generator was then disconnected and the universal motor in the yard started. The noise pick-up on the antenna and fed directly to the receiver was +18 db. The signal generator was then turned on. No trace of signal could be heard from the receiver itself and the db meter still read +18. The signal generator was turned off, and the antenna change-over switch operated to insert the preselector ahead of the receiver. The noise, with the set and the preselector tuned for maximum, was then 25 db. With the universal motor still running, the signal generator was turned on and with the preselector ahead of the set, the

(Continued on page 58)

Fig. 6 — Non-regenerative preselector circuit with coupling tube.

January 1940

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HAM ☆ SHACKS

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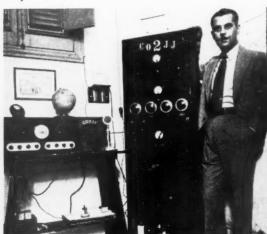
CO2LY, Havana, Cuba





PK4KS, Pangkalpinang, Sumatra







QST for

CO2LY

Up to the time of the recent shut-down of ham radio in Cuba, Manuel Gonzalez of CO2LY in Havana was one of the outstanding characters on 14-Mc. 'phone. You were lucky to swap numbers with him during the last DX contest (he said he ran out of numbers), but you certainly can have a whale of a ragchew with the "screwball of the West Indies," as he calls himself. No moment spent with CO2LY is ever dull, especially if you are equipped for "push-to-talk." But you have to be prepared to do some fast thinking before you call him if you are to keep up with the constant fire of wit and humor which rolls off his tongue like water. Completely at ease at the mike, he's one ham who can take 'phone in natural stride free from forced or stilted effects. He doesn't know the meaning of "Hi," but you have no doubt about it when you have succeeded in hitting a vulnerable spot in his funny bone.

Since he refuses to talk shop over the air, a peek into his station should be of unusual interest. The main transmitter is the rack job to the left. It includes a single T-125 final modulated by Class-B 830's. A low-power rig on the table consists of an 807 modulated by Class-AB 6L6's and the receiver is an RME-69. The present antenna is a Johnson Q running east and west, although he

has plans for a 2-element rotary.

Mr. Gonzalez is secretary to the vice-president of the Havana Electric Railway Company. Making his start in ham radio in 1937, he has since completed both WAC and WAS and has worked several good bits of DX with the "peanut-whistle."

Now that the ban is lifted, we expect that the flow of chatter which has been dammed up for the last few months will be greater than ever.

PK4KS

REMEMBER the daily dog-pile around 14,300 in the last DX contest? Each time the smoke cleared away, there at the bottom of the pile would be PK4KS bravely struggling to handle five numbers at once. For most of us, Sumatra was a new country as well as a contest

multiplier.

The rig which was responsible for all the commotion is a three-stage affair with 6L6 Tri-tet oscillator, 801 buffer and a pair of T55's in pushpull in the final, operating at 225 watts input. When on 'phone, the final is modulated by a pair of Telefunken RV2400 tubes operating as Class-AB amplifiers. Both transmitter and 12-tube superhet receiver were built by Mr. Tan Koon San who owns and operates the station which is situated in Pangkalpinang. The antenna used was a half-wave dipole but a rotary 8JK is under construction.

PK4KS has been on the air only since January 1939, but in the intervening time has made WAC on both 'phone and c.w., has worked 75 countries

and needs only four states for WAS. Most of his work has been done on 14 Mc., but he occasionally chews the rag with W6's on 7 Mc. with an 8-watt rig.

His occupation is that of manager of a local talking-picture theater.

CO2JJ

CO2JJ is another well-known Cuban 'phone station. It is the station of Dr. Rene

Espinosa, a dentist in Havana.

Starting up in December 1936 on 14-Mc. 'phone with 42 watts input to an 801 final, CO2JJ made WAS in the first year using only the one frequency of 14,120 kc. The present transmitter is built into a standard rack. The r.f. line-up consists of a 53 oscillator-doubler, a TZ40 buffer and T55 final running at 125 watts input. The final is modulated by Class-B 46's driven by two 57's and a Class-A 46. The receiver is the ACR-175.

The antenna is a vertical half-wave of copper tubing erected on the roof of the apartment in which CO2JJ is located. It is fed with Zepp

feeders at the base.

With this modest equipment, CO2JJ has placed fourth among the 'phone stations outside U.S.A. in both of the last two DX contests.

W2DBQ

ONE OF the most consistently active hams in traffic handling and organization activities in the eastern part of the country is Dick Nebel, W2DBQ. He joined the ORS and AARS groups in 1931 and has been going strong ever since.

The transmitter consists of 59 crystal oscillator, 802 buffer, 210 driver and 242A final running at 200 watts input. Although he spends ninety per cent of his time on 3.5-Mc. c.w., the rig is capable of working all bands and is equipped for modulation with Class-B TZ20's for AARS tie-in and a few other skeds. The same single-wire and end-fed antenna has been in constant use for all work for the past several years. Receiver is the FBXA with preselector.

Dick is an R.M. and Chief Section Emergency Coördinator in the A.R.R.L. and Southern New York State Radio Aide in A.A.R.S., holding the call WLNB. Professionally he is engaged in the production of quartz crystals and associated equipment. Checking apparatus may be seen in

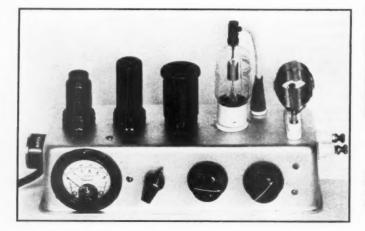
the photograph.

In spite of the fact that he has been stricken with infantile paralysis since 1916, he's the spark plug in N.Y.C.-L.I. activities and gets around to ham gatherings in his Section.

VS6A0

In the lower right-hand corner we give you a peek at another of those DX stations whose operator has plenty of trouble on his hands when

(Continued on page 58)



An interesting and effective outfit for the chap who hasn't room for a big transmitter, but wants a fair amount of power with multi-band operation. a ha

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Compactness, safety and simplicity of operation are outstanding features of this 75-watt transmitter. The chassis is a cake pan.

Compactness With Economy

A 75-watt Input Transmitter of "Pocket" Dimensions

BY ALLEN MONDERER.* WOVCX

The transmitter described in this article is the result of a process of evolution and did not come from this ham's sitting down and designing a transmitter for a specific purpose. However, as the idea of an extremely small medium power transmitter grew, certain definite requirements and features became desirable or necessary. These were (1) the power input to the final plate should be between 50 and 75 watts, (2) the unit must take little physical space (the writer was still in school at that time and the rig was still being moved about), (3) it must be usable on the 10-, 20-, 40-, and 80-meter bands, and (4) modern safety requirements must be met.

The set originally was constructed on a cake pan obtained from the nearest hardware store. This method of construction has been recently described in $QST.^1$ The thin metal of cake pans did not prove strong enough for use in the permanent station transmitter, and something was missing in the appearance of such a unit. Subsequently the entire field of metallic kitchen utensils was investigated with a view of finding a suitable metal chassis. The problem was solved with a Mirro Aluminum Fruit Cake Pan. This is $3\frac{1}{2}$ wide by $10\frac{1}{2}$ long by $2\frac{3}{4}$ inches deep, and the walls are thick enough to support the parts without any bending.

CU. TIL

The Circuit

The oscillator is of the Pierce type, employing plate to grid feedback through the crystal. By loading the oscillator heavily and keeping the plate voltage low, the r.f. crystal current is in the neighborhood of 30 ma. Condenser C_3 keeps the d.c. plate potential off the crystal. This is in keeping with the safety requirements, since the crystal is above the chassis. The value of C_4 may seem large, but this helps to load up the oscillator more completely.

The buffer amplifier is a type 6V6 tube. The amount of oscillator output dictates the use of a beam tetrode in the next stage. A 6L6 was first used, but it delivered more power than was necessary to drive the final amplifier. The 6V6 gives ample output and only requires one-half as much heater current.

Coupling to the grid circuit of the final amplifier is through the untuned secondary coil L_3 , which is wound between the turns at the lower end of L_2 . This close coupling eliminates the need of tuning L_3 , and the correct grid drive is obtained by pruning the number of turns in L_3 . Bias for the final amplifier is obtained through R_5 and R_6 . Pins A and B are in the coil form (a 5-pin form is used) and are jumpered when straight-through operation is used in the final. If doubling (or even tripling) is wished, the jumper is left out and both resistors are then in series. Separate forms are used for each condition. The

^{*1467} Fargo Avenue, Chicago, Ill.

1 Gale M. Smith, "A Hurricane Emergency Transmitter and Power Supply," QST, July, 1939.

jack J was included to allow grid modulation at a later date. It removes the bias resistors, and battery bias may be used in series with the modulator.

The final amplifier is a Gammatron HK-24. This tube was one of many tried in this position and won out through its ruggedness, ease of driving, power rating and small physical size. The plate tank circuit uses a split-stator condenser to obtain the voltage for neutralizing. The small physical space available for the tank condenser indicated one with small plate spacing. The d.c. plate potential is kept off this condenser by the use of shunt feed to the plate. This also keeps the tank coil at ground for d.c. — one of the safety features. The choke L_7 brings the coil and the hot sides of C_{13} to ground for d.c., but isolates the center-tap for r.f. If the center-tap of the coil were grounded directly, the balance of the split tank circuit might be destroyed and reneutralizing probably would be necessary with each change of coils. As it is, the neutralizing holds over all bands. Low voltage is obtainable, when tuning up, through switch Sw2. If the high voltage is applied before the final amplifier is loaded by the antenna, the tank condenser will are over. The special mechanical features of this circuit will be described more fully later on.

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Keving is accomplished by blocking the grid of the HK-24 with a high negative bias. For ease of operation and frequency stability, the crystal and its buffer stage are left running all during a transmission. If break-in is desired, a time delay circuit must be included to hold the oscillator and buffer on during keving. The bias for keving is supplied by the 1000-volt plate supply for the HK-24. A 40,000-ohm bleeder in the power supply is tapped at about +300 volts. The center-tap of the transformer supplying the filament current for the final amplifier is connected to this 300volt tap. This gives the tube a negative bias, the grid return being connected to ground. To key, the 300 volts is simply shorted to ground, thus removing the blocking bias. The value of R_{11} is a compromise between a sufficient bleeder current for good power supply regulation and a small additional load with key down. This system is free from any key clicks or thumps.

A single 10-ma, meter is used to meter the buffer plate, and the final amplifier plate and grid circuits. A two-pole, three-position selector switch connects the meter across the shunts R_7 , R_8 and R_9 . The shunts remain in the circuit at all times. The size of the shunts may be calculated from the formula

$$R_{\rm shunt} = \frac{I_{\rm meter} \times R_{\rm meter}}{I_{\rm total} - I_{\rm meter}}$$

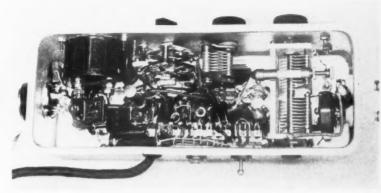
Construction

The general constructional details are shown in the two photographs of the unit. The crystal is at the left side. Along the top are the 6C5 oscillator tube, the 6V6 buffer, the buffer tank coil, the HK-24 final and the final tank. At the right end are the feed-through insulators for the r.f. output. Along the front panel are the meter, the switch for the meter, the buffer tuning and the final amplifier tuning. In back are the power cable, the final amplifier grid-circuit jack, and the high-low plate voltage switch.

As the below-chassis view shows, the component parts for the first two stages are closely spaced, and care must be taken in their placement. All power connections are made to the terminal strip across the back. This strip must be of a good quality to prevent breakdown from the high voltage.

The meter shunts were made by calculating the proper resistance and then selecting a wire of suitable length from the wire tables of the A.R.R.L. Handbook. Ordinary d.c.c. copper wire was used and the size was such that the length was about six feet. The shunts for the first two stages are wound on a small bakelite spool mounted beneath the meter. The high voltage shunt was wound on a half-watt resistor of any size above 100 ohms. This is kept from the low-voltage circuits to prevent breakdown. The switch is a standard Yaxley selector switch of the non-shorting type. Any other switch may be used if it has good insulation. The meter must have a

Not much wasted space under the chassis. A bottom view of the transmitter, showing the wiring.



bakelite zero-set pin to keep the high voltage from appearing on the exposed portion of the transmitter.

The wiring and construction of the first two stages is quite conventional and follows usual practice. The novel features of this transmitter occur mainly in the final amplifier. The shields of the metal tubes are grounded.

The final tank coils are the National A-R16 series. Their catalog indicates that these will tune with a 30- $\mu\mu$ fd. condenser, but inquiry at the factory disclosed that this is the capacity at

which they hit the band. Consequently a larger condenser is necessary. The only split-stator condenser made in small enough physical size for this transmitter is the Cardwell Dual "Trim-Air." Their regular stock did not include a condenser of sufficient capacity with the required plate spacing (0.030") so a special one was ordered. This follows under the standard numbering as type ER-75-AD. The rear shaft of the condenser was not cut off, but was left protruding through the rear panel, thus providing an extra point of support. Since the front bearing was

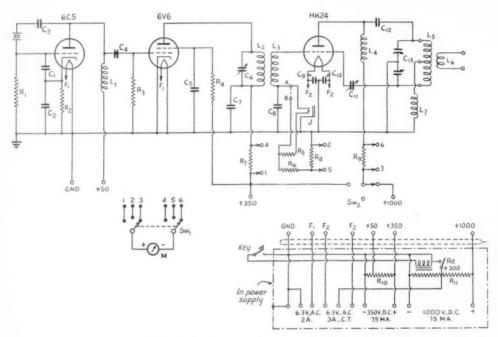


Fig. 1 — Circuit diagram of the compact 75-watt transmitter.

Fig. 1 — Circuit diagram of t
C ₁ — 50-μμfd. postage-stamp mica, 200-volt.
$C_2 = 0.006 \cdot \mu fd$. postage-stamp mica, 200-volt.
$C_3 = 0.006 \mu fd$, postage-stamp mica, 200-volt.
C ₄ — 0.001-µfd, postage-stamp mica, 200-volt.
$C_5 = 0.006 \cdot \mu fd$, postage-stamp mica, 500-volt.
C ₆ — 100-μμfd. midget variable (Cardwell ZU-100-AS).
C ₇ — 0.006-µfd. postage-stamp mica, 500-volt.
$C_8 = 0.006 \text{-} \mu \text{fd. postage-stamp mica, } 500 \text{-} \text{volt.}$
C ₉ — 0.006-μfd. postage-stamp mica, 500-volt.
C ₁₀ — 0.006-µfd. postage-stamp mica, 500-volt.
C ₁₁ — Neutralizing condenser (National NC-600).
$C_{12} = 0.002$ - μfd , mica, 1500-volt working.
C ₁₃ — 75-µµfd, dual variable, 0.030" spacing (Cardwell
ER-75-AD).
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$R_1 = 25,000 \text{ ohms}, \frac{1}{2}$ -watt (BT- $\frac{1}{2}$).	
$R_2 = 1000 \text{ ohms}, \frac{1}{2}$ -watt (BT- $\frac{1}{2}$).	
$R_3 - 100,000 \text{ ohms}, \frac{1}{2}$ -watt (BT- $\frac{1}{2}$).	
R ₄ — 10,000 ohms, 2-watt (BT-2).	
R5 - 5000 ohms, 5-watt (Brown Devil).	
R ₆ - 5000 ohms, 5-watt (Brown Devil).	
R7 — Meter shunt, 100 ma. (see text).	
R8 — Meter shunt, 50 ma. (see text).	
R ₉ — Meter shunt, 150 ma. (see text).	
R ₁₀ — 20,000 ohms, 25-watt, voltage divider	(Divid-
ohm).	
R ₁₁ — 40,000 ohms, 50-watt, voltage divider	(Divid-
ohm).	
$L_1 - 2\frac{1}{2}$ -mh. r.f. choke.	

L ₂ , L ₃ —Buffer Band	Final Band	L ₂ Turns	L ₃ Turns
3.5 Mc.	3.5 Mc.	36 turns, No. 24 enam.	18 turns, No. 28 d.s.c.
7 Mc.	7 Mc.	18 turns, No. 18 enam.	10 turns, No. 28 d.s.c.
7 Mc.	14 Mc.	18 turns, No. 18 enam.	13 turns, No. 28 d.s.c.
14 Mc.	14 Mc.	12 turns, No. 18 enam.	9 turns, No. 28 d.s.c.
14 Mc.	28 Mc.	12 turns, No. 18 enam.	12 turns, No. 28 d.s.c.
	L ₃ i	nterwound between L2 (see text).	
L ₄ — 21/2-mh. r.f. chok	e. h	M — 10-ma. milliar	nmeter, 2" diameter.

1 01:0 1 1 1 1	- 0		
L ₄ — 21/2-mh. r.f. choke.* L ₅ , L ₆ — Amplifier tank coil,	National	AR-16	series,
center link.			
$1.7 - 2\frac{1}{2}$ -mh. r.f. choke.			

center link. $Sw_1 - 2$ -pole, 3-throw set $L_7 - 2\frac{1}{2}$ -mh. r.f. choke. $Sw_2 - Single$ -pole, 3-throw $L_7 - 2 \frac{1}{2}$ -mh. r.f. choke. $L_7 - 2 \frac{1}{2}$ -mh. r.f. choke. L

Re — Keying relay, 6.3-volt a.c. Sw₁ — 2-pole, 3-throw selector switch. Sw₂ — Single-pole, 3-throw toggle switch, high-voltage type.

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grounded, the rear bearing was supported on an insulated bushing to prevent closed paths in the tank circuit and thus eliminate eddy-current losses. The small grid-leak shaped device across the tuning condenser is the neutralizing condenser. The plate blocking condenser is at the right, with the plate feed choke at the left. The choke between the output feed-through insulators is the one in the center tap of the tank coil.

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The only places where high voltages appear above the chassis are at the buffer tank coil and the plate lead of the final tube. The buffer coil is wound on a 1½ inch diameter form with enameled wire. A heavy application of coil dope insulates this winding. The secondary winding must be of double-silk-covered wire and is applied after the primary is doped. The number of secondary turns is adjusted until the desired grid current flows with full load on the final.

The plate lead for the HK-24 comes through the chassis on a ceramic feed-through insulator. The flexible lead is covered with small ceramic beads, and the connection to the insulator is covered with a rubber sleeve such as is used on test clips. There is no insulated plate cap on the market for use on tubes with a pin-type terminal such as the Gammatron and Eimac series. Such an item is necessary if our equipment is not going to have exposed high voltages. In this instance, the problem was solved by making a cap from a pin-tip jack in a molded tube. The threads on the tube were turned down and the top end sealed. A hole through the side admits the beaded lead.

The keying circuit is in the power supply, which is not shown. Any supply that will furnish 350 volts at 75 ma. and 1000 volts at 75 ma. may be used. The 350-volt source cannot be tapped from the 1000-volt one, since the bleeder is used for keying. The supply in use has three 82's in a bridge rectifier, which furnishes two sets of voltages (see A.R.R.L. Handbook). Separate filament transformers are used for the low power and the final stages. When the key is up the final filaments are above ground by 300 volts. If the metal tubes are heated from the same winding, the heaters are 300 volts above their cathodes and the internal insulation may break down.

Operation

The tuning and operation of this transmitter is quite simple. The plate voltage of the final amplifier is removed by placing the switch Sw_2 in the open position. The neon bulb used for neutralizing cannot be larger than $\frac{1}{4}$ watt for perfect neutralizing. The neutralizing condenser is adjusted with the eraser tip of a pencil, and is then locked with the set-nut on the shaft. It will hold neutralization on all bands.

The plate current in the buffer stage is not important, and it is read only to indicate resonance. The grid current in the final should be about 20 ma. and the plate current 75 ma. when operating

under load. The high voltage should not be applied to the plate without a load.

The power supply and antenna coupling unit have not been described, since each operator has his own ideas on these matters. At W9VCX the antenna is tuned by a "pi" network, fed by a link from L_6 .

The power input to the transmitter is 75 watts, which is large considering the physical size of the rig. Higher plate voltages than 1000 are not recommended, and care must be taken in wiring to prevent breakdown at this voltage in the small chassis.

Strays %

"Since left-handed bugs are somewhat higher in price and second-hand ones hard to obtain, it is useful for the 'southpaw' to know that the standard Vibroplex may be reversed by disassembling, turning the base over and reassembling." — W9EKW.

"When the type 42 in my receiver burned out suddenly the other night, and I had no spare, I substituted a 6D6 in the socket. It seemed to work almost as well as the 42 and was a most satisfactory substitute for such an emergency. The suppressor in the 6D6 assumes the role of control grid." — Neal Corathers, Keyser, W. Va.

W8AQY says that it will pay occasionally to swab the switch contacts in a band-switching receiver with a toothpick and cotton soaked in carbon-tetrachloride. This removes the accumulation of dust which is frequently responsible for noise in receivers of this type.

Faith Rogers, who writes a newspaper column of personal advice, has the following sentence in one of her letters to a young lady:

"Ask him something about radio; there are so many amateur operators these days."

For the reassurance of the low-power beginners who receive discouraging advice to the effect that present-day operation requires high-power gear, W4FRU of Memphis, Tenn., sends this note: "... I worked W5EWK of Tom Bean, Texas, who was using as his xmtr a '19 tube in a Hartley oscillator with 3 watts input. His report in Memphis was RST 589. W5EWK's antenna is a 66-foot grounded (Marconi), and his receiver is a 2-tube outfit using '30's."

Recovering from a case of pneumonia, W2GFW recently spent eight weeks in a hospital. A nurse, noticing him reading QST, remarked that there was a young fellow in another room reading the same "queer" magazine. The "other fellow" turned out to be W2LIQ, also suffering from pneumonia.



ON THE ULTRA HIGHS



CONDUCTED BY E. P. TILTON.* WIHDO

Who said "5" is a summer band? A fortunate combination of conditions during the intense activity of the second U.H.F. Relay, November 4th and 5th, offered convincing proof that both skip and local-range DX can be worked in the fall and winter months. Then, as if to show that the results earlier in the month were no freak, late November offered several more nights of good local-range conditions, in the Northeastern States at least.

If the weather had been made to order it could not have afforded a better example of the relation between atmospheric conditions and u.h.f. bending than existed over W1, W2, and part of W3 during Saturday evening, November 4th. Weather maps for Friday and Saturday tell the story, showing a storm area heading toward New England from the south and west: An unusually warm noonday sun paved the way for the inevitable temperature inversion when the cooling of late afternoon set in. By 4 P.M., November 4th, the local range at Wilbraham had stretched out to 200 miles or more, and all signals beyond actual line of sight were up to the summer average. This condition prevailed until shortly before noon on Sunday, when heavy rains sweeping in from the southwest washed out the favorable state of

Many operators were quick to take advantage of this break, with W1LLL, W1HDF, W1INF, and others in Western New England working W1HXP, W1DEI, and several others in the Boston area; no mean accomplishment when it is considered that elevations of 1200 feet or more intervene at several points, with the stations at each end at 200 feet or less above sea level. The extended local range worked to the advantage of the fellows in the New York area also, with W2MO, W2IDV, W2AMJ, and W3HOH knocking off several contacts each for 5 points (over 100 miles). It is interesting to note that work to the south and west from this area was not so successful, precipitation having already occurred in the vicinity of Washington, D. C., and over Ohio.

As to contest results, it is too early to give complete data on the standings, but it appears certain that the winner was, again, W3AC/3. Operating at High Point, N. J., the scene of his victory in the first u.h.f. contest, Goyn again turned in a total nearly twice that of his nearest competitor. Massed closely together in a scramble for second place were W2MO, W3HOH, W1KLJ, and your conductor. That the relay idea is really taking hold is shown by the tremendous increase

*329 Central St., Springfield, Mass.

in participation and the greater distances covered by many of the messages. Complete details next month.

The high spot of the contest, for many, came at 4:15 p.m., Sunday; when, with activity beginning to lag, W9ZHB set the band on fire by breaking through for the first W9-W1 QSO in many a day. He was quickly followed by W9's CBJ, Washburn; ARN, Bartonville; ROQ and LLC of Pekin; RGH, Peoria (all of central and southern Illinois); and HWF of St. Louis, Mo. While this was going on CLH, Elgin; VHG, Glenview; ZFH, Oak Park (all Illinois); and GGH, Kenosha, Wis., were working into New York, New Jersey, and Pennsylvania. All the latter group are considerably north of those reported in New England. W9ZHB was the only station reported in both areas.

Lines drawn between points where contact was established form a definite "X" near the Pennsylvania-Ohio border, indicating that a fairly small sporadic E "cloud" over this vicinity accounted for all the fun. This is borne out by the experience of W3AC/3 (northwest corner of N. J.), who, upon hearing the 1's and 2's calling 9's, turned his ice-laden beam, only to be unable to hear a trace of skip DX! In between, also, was W8PK, E. Bloomfield, N. Y., who found the band a complete washout, though short skip from W1 and W2 was very strong on "10."

A minor prelude to the skip "matinée" occurred between 10 and 11:30 a.m. This was of such limited nature that it went unnoticed by the majority of the gang. At 10:17 W8LKD, Cuyahoga Falls, Ohio, worked W1LSN, Exeter, N. H., his first W1; and W1EKT heard W9ISX, Clarendon Hills, Ill., at 11:05. After the main show described above had faded out, things opened up again at 6:25 p.m. when W9ZJB, Kansas City, Mo., was heard weakly on c.w. by W1LLL and your conductor, as he was working W9VWU. We can imagine Vince's consternation when he learned that the band was open during his one lone contest QSO!

All the DX worked and heard was apparently the result of ionization over a limited area, and it's a safe bet that, had November 5th been just any Sunday instead of the second day of the U.H.F. Relay, the whole business would have gone unnoticed. Those of us who are regularly active on "5" know of countless instances when conditions seem ripe for DX yet nothing is heard, simply because no activity is going on in the areas affected. Such a situation confronted W1KTF on November 18th, at 9:30 A.M., when Dave heard

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HK-54's, an Extended Double Zepp, and the famous Lester Converter work wonders under the guidance of Frank Lester, W2AMJ. The combination resolves in an outstanding W2.

the harmonic of a W9 working another on 28 Mc. The characteristic "swish" which so often accompanies DX was apparent but, though he CQ'd long and loud, Dave had no luck on "5." Similarly, W9ZJB and W9VWU heard a harmonic of W6CAH at 4:35 P.M., November 12th, without hearing any other sigs on "5," This is the only California sig ever heard by Vince on 56 Mc. The 1940 Marathon, announced elsewhere, should do much to stimulate consistent local activity, making it more likely that fellows will be active throughout the country when conditions break for skip DX.

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You fellows who have a hard time drumming up local activity should have a listen to the meetings of the 56-Mc. "Minute-Men" any Sunday at 10 A.M. Under the capable control of W1EHT of Stoneham, a snappy roundtable is conducted, following which the meeting is opened to anyone within range who may wish to join in. Another example of the beneficial effects of 56-Mc. organization is the success of "The Horsetraders." Originally a group of Connecticut Valley 5-meter men, "The Horsetraders' grew out of the jocular rag-chews of W1MY, W1FLQ, WIQP, WIJLK, and others, and has, since its inception in 1935, grown to include 135 members in W1, 2, 3, 8, and 9, its scope extending from Boston to Kansas City, Mo. All good "Horsetraders" are on the air at 7:30 each Tuesday

W2MO, Livingston, N. J., with up to 700 watts to a pair of special FT-114-A's feeding an 8-element rotary atop a 90-foot tower, continues as one of the outstanding u.h.f. stations in the East. Earl keeps regular skeds with W3DBC, Washington, D. C. (200 miles) and W1HDQ (120 miles). And it's not all transmitter at W2MO - Earl worked

W3GMZ in Washington recently, when the latter was using a 6L6 doubler-final. There's a receiver at 2MO, too! It's a Lester Converter ahead of an HQ-120. Which brings up Earl's long-time rival for top honors in W2, Frank Lester, W2AMJ, Bergenfield, N. J. That guy's always on! It's been said of Frank by W3AIR: "When they nail down the lid on him, he'll be calling 'CQ-Five'!" Frank's sponsorship of the Extended Double Zepp * has caused this very efficient sky-wire to be practically "standard equipment" among the u.h.f. fraternity who haven't the space or facilities for a high-gain rotary. With the aid of the "E.D.Z.," Frank's HK-54's and Converter (of course) certainly do a fine job. W2AMJ and W2MO are found regularly on 56,864 and 56,630 respectively. There are times when "5" would be plenty lonely without these two old-timers.

Big noise in the Nation's Capital is made these days by

W3DBC, with 600 watts or more to a pair of 100TH's and a "Lazy-H." Blair uses a Lester Converter (it's a habit) ahead of his HRO to pull in plenty of stuff over 100 miles distant. On November 21st, at 10:30 p.m., Blair's c.w. was heard at Wilbraham for a brief interval. This is a hop of about 300 miles which is not too bad for late November! Other stations active around Washington recently include W3's EEN, AWS, and IIS (ex-W2KKS).

High power, while undoubtedly an asset, is not necessary for real performance on "5." Bob Elmer, W3BZJ (56,412), does all right with 125 watts input to a pair of T-40's, having 27 states in 8 call areas to his credit. Under favorable local-range conditions Bob is frequently heard in the Boston area, some 250 miles away. W3BZJ is on nightly the boston area, some 230 miles away. W3BZJ is on nightly between 10 and 11 P.M., and usually on the job Sunday mornings. Bob's receiver is a new RME HF-10. Reliable contact is maintained with 3BKB, York, Pa. (100 miles), 3FQS, Reading, Pa., 3CUD, 3HOH, 2AMJ, 2MO, and

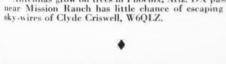
A recent letter from W4EDD states that skeds are kept regularly with W4DRZ at 8:45 a.m. and 5:50 p.m., with few stations being heard otherwise. Both Bud and Robbie expect to give 21/2 a try early in 1940. Watch for W4DX on 112 Mc. It appears that we may hear some other W4's when "5" opens up for that area again. From SCM reports we learn that 4DLO has a beam on a 95-foot pole, and that 4FOX and 4GAM are active.

From Dallas, W5AJG reports "all quiet on five." No igs were heard during either u.h.f. contest. A number of W5's are reported a-building for 21/2, so Leroy looks forward to a good showing in the Marathon. 5AJG is not exactly out of the running on 56 Mc. either, having tied W3BZJ at 27 states and 8 call areas, needing the inevitable W7

W6QLZ, Phoenix, Ariz., continues to be one of the most enthusiastic u.h.f. men in W6. Clyde maintains skeds regularly with 60VK of Tucson, but as yet they have been unable to break down the 140 miles of "rough old desert" in between. We hope the winters are not too severe in Phoenix, for it's sure to be cold at QLZ, with all those holes in the wall where the feeders come into the shack. We hesitate to state what Clyde uses for antennas - the dope would be obsolete before we get to press! With fairly frequent reception of West Coast 10-meter sigs up to 500 miles away, Clyde has hope of doing business on "5" also. The 10-meter sigs frequently have "rain-barrel" quality and are apparently bent into Phoenix by lower-atmospheric refraction (Continued on page 86)

*See article by Arthur Lynch in November '39 QST.

Antennas grow on trees in Phoenix, Ariz, DX passing near Mission Ranch has little chance of escaping the sky-wires of Clyde Criswell, W6QLZ.



January 1940



Improved Pi-Section Antenna Coupler

Simple Alterations for Wider Impedance Range and Better Harmonic Reduction

BY R. B. JEFFREY. * W8GDC

ALTHOUGH the pi-section antenna-coupling network was introduced some years ago in amateur work as a cure-all for antenna-coupling troubles, those who have had occasion to use the system over a period of time under a wide range of circumstances have doubtless encountered cases where the system refused to do much of anything. Particularly bothersome are the cases where the feeders or antenna happen to be exact multiples of one-quarter wavelength long. When the feeders are exact odd multiples of one-quarter wave in length, the line impedance is very low and requires that the filter output condenser be of an impractically large value. Conversely, when feeding lines exact even multiples of one-quarter wave in length, the line impedance is so high that proper matching requires a value of filter output capacity too low to obtain in practice. In both cases, it may be possible after considerable adjusting to find some combination of inductance and capacity which will load the output amplifier, but the output condenser is a total loss so far as a convenient means of adjusting the power input is concerned. Its adjustment frequently has no effect whatsoever. Invariably under these circumstances, tight coupling between the final tank circuit and the filter must be used to obtain satisfactory loading and the taps on the tank coil must be spread out towards the ends of the tank coil. It has been demonstrated 1 that tight coupling is to be avoided if harmonic output is to be minimized.

To overcome these drawbacks, several modifications of the straight pi-section filter were tried. In an early version, tight coupling with feeders of odd quarter-wavelength multiples was avoided by shifting the inductances and capacities to form a simple series tuning system with the inductances as feeder loading coils. This arangement worked out very well except that the loading-control effect of the output condenser was lost. The success with this system, however, finally led to the arrangements shown in the diagrams of Fig. 1. In these circuits additional inductance sections have been added in the output sides of the filters. The most simple explanation of the function of these additional inductances is that they work as loading coils to bring the antenna-system terminal impedance to a value which can be readily matched by the usual filter without resorting to excessively tight coupling. With this arrangement, the output condenser has control of the loading under all conditions. It is possible to work a 30-foot antenna at 1.7 Mc, or a 200-foot antenna at 56 Mc, with equal ease. Sufficient variations in values may be obtained with the one set of coils and condensers to cover any set of conditions which may be encountered over this range of frequencies. Such an arrangement is especially advantageous in portable and emergency work where almost any old piece of wire may have to serve as the antenna.

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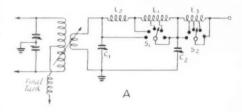
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An equally important feature of the operation of the system is that loose inductive coupling is sufficient to give proper loading under all conditions and, therefore, harmonics in the output are greatly reduced. No critical adjustments are required to obtain satisfactory harmonic reduction.

Referring to Fig. 1-A, L_1 may be approximately 75 turns close-wound on a 3-inch diameter form with five or six taps equally spaced. L_2 is simply an extension of L_1 and is used to avoid having too many shorted turns on an active coil. It



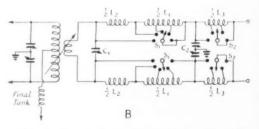


Fig. 1 — Improved antenna network with wider working range. A — For single-wire feeder or end-fed antenna. B — For two-wire lines or center-fed antenna. Values are given in the text. C₂ should have a capacity of 200 $\mu\mu$ fd. per section.

^{* 2255} N. 4th St., Columbus, Ohio.

¹ Woodward, "About This Harmonic Radiation Problem," QST, Feb. 1937.

In spite of certain shortcomings, the pi-section network still remains one of the most popular types of antenna coupler. W8GDC now tells us how, with a few simple alterations, to avoid these weaknesses. The resulting coupler is truly universal and may be operated with loose inductive coupling, greatly reducing harmonic troubles.

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should have about ten turns close-wound on a oneinch diameter form; it is used only when working at the higher frequencies. If high-frequency operation is not desired, this inductance may be omitted. L_3 has approximately 30 turns, close wound on a 3-inch diameter form. C_1 should have a capacity of 500 µµfd. Receiving spacing is satisfactory with powers up to 200 watts or more. C_2 should have a capacity of 100 to 200 $\mu\mu$ fd. and plate spacing about twice that of C_1 . The higher capacity gives a greater range of control of loading. The three coils should be mounted so that there is no appreciable coupling between them. The coupling between the final tank coil and th filter should be very loose. Some form of variable link coupling is strongly recommended. We use Johnson variable-link coils and the angle between the axes of the link and tank coils is never less than 80 degrees.

The tuning procedure to be followed varies somewhat from that recommended for the usual arrangement of pi-section coupler. With the coupling link set near minimum, the final-amplifier tank circuit is tuned to resonance. L_3 should be short-circuited and C2 set near maximum capacity. Then, trying various positions of S_1 , C_1 should be varied until the plate current shows a sharp increase and then tuned to plate-current peak. Rechecking resonance in the amplifier tank circuit should show little change in the resonance point. If appreciable retuning is necessary, the coupling to the tank is too tight and should be reduced. There should be very little interlocking between C_1 and the final tank condenser. If the resulting plate-current value is not the correct operating value, C₂ should now be adjusted and the tuning process repeated. A new value of plate current should result. In most cases a decrease in capacity of C_2 will result in a higher value of plate current and, vice-versa, an increase in capacity will reduce loading. In some cases, however, the effect of C_2 will be reversed. In any event, varying C_2 should not greatly affect the setting of C_1 . Now, if the highest obtainable value of plate current is less than the desired operating value, or if the antenna refuses to take power readily, set S_2 to include the first part of L_3 in the circuit and repeat the whole tuning process. A new value of plate current should result which will be larger than before. If it is still impossible to load the

final amplifier properly, increase the setting of S_2 until the desired operating plate current is obtained. At all times, the coupling between the final tank and the filter should be loose.

The arrangement described has been used to couple the transmitter to a single wire approximately 150 feet long on 160, 75, 20 and 10 meters. Several other antennas have been tried with equal success. It is possible to vary the loading from practically zero to maximum plate current by adjustment of C_2 and the tap switch.

Fig. 1-B shows the arrangement for center-fed antennas or two-wire lines. The coils should each have half the number of turns specified for corresponding coils in the single-wire circuit of A. In adjusting inductances, corresponding coils in each side should be adjusted simultaneously, maintaining an equal number of turns in each.

SWITCH TO SAFETY!



W2GP SENDS us a copy of Underwriters' Laboratories special report of an investigation on electrical shock as it pertains to the "electric fence." Although not about radio, much of its summary of known data has direct application to our work.

It is, of course, the current flow through the body which does most of the damage in electrical accidents. Currents as low as 49.2 milliamperes have been fatal, and there seems to be ample medical experience to show that 100 ma. maintained for more than one second is extremely likely to be fatal. Body resistance from hand to hand (our chief danger) averages around 3500 ohms, and with moist hands and good contact may be less than 1000 ohms. Of course we know that 3000-volt supplies are lethal, even before we calculate that they might cause 3 amperes to flow through the body; but we must here observe that a 300-volt supply is almost equally certain to cause death, even at average contact resistance, if the contact lasts much over a second. We have unhappily already had that proved to us in the unfortunate death of W9VYU.

What, then, are the chances of our not maintaining the contact that long? Not very good. High currents can be endured for only a very few ten-thousandths of a second without death. Moreover, the Underwriters' Laboratories ran tests to determine the maximum current that an individual could withstand for a short time and still have voluntary control of his muscles—such that he could drop an electrode or pull away from a contact. The maximum current that any individual could withstand was 10 ma., the minimum

(Continued on page 63)

Personality Over the Air

How the Ham Stacks Up in a Poll

BY E. LOWELL KELLY. * W9EWL

Amateur radio, as every ham knows, makes possible a unique type of acquaintanceship or even friendship. How many times have you signed "SK" or "off and clear" and then murmured to yourself, "I like that chap," or, "He's one whose CQ I will never answer again"? Accurately or not, there is a definite tendency for an operator to form certain judgments concerning the other fellow's personality, even during the first contact. With successive contacts, these first impressions are strengthened or modified until one comes to feel that he really "knows" the fellow at the other end as a personal friend.

Because of my professional interest in people, I found it fascinating to meet personally other hams with whom I first became acquainted by amateur radio. As everyone who has had similar experience will realize, many of one's previous impressions are substantiated by the personal meeting, but in other respects the individual may prove to be quite a surprise. Often I find a chap to be just as I had imagined him to be, but not always. In a few cases the contrast between my



"OFTEN I FIND A CHAP TO BE JUST AS I HAD IMAGINED HIM TO BE, BUT NOT ALWAYS"

concept of the individual and his flesh and blood personality has proven so great that I could scarcely believe I was meeting the person with whom I had talked on twenty-meter 'phone.

Nevertheless, we continue to be impressed by the other fellow's voice, his grammar, his habits of speech, or, in the case of c.w., by the style of his fist, his long or short CQ's, his method of making abbreviations and many other cues. After pondering over this situation for some time, the writer decided to conduct an investigation ¹ to determine which personality traits could be most

accurately judged over the air and which did not seem to be revealed in QSO's.

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For practical purposes personality may be defined as the sum total of the characteristics possessed by an individual at any given time, characteristics which make him unique and enable us to recognize him as an individual. Although many tests for personality traits have been developed within the last twenty-five years, still one of the most accurate means of evaluating a given personality is that of having a number of the individual's personal acquaintances rate him on a personality rating scale. Two acquaintances will not necessarily agree concerning the relative amount of any trait possessed by an individual, but it has been found that the pooled judgment of several ratings of an individual yields a relatively stable average which does not shift markedly if a second group of acquaintances is asked to rate the same person.

A commonly used rating scale is the graphic type on which acquaintances are asked to place a check mark on a scale line indicating where, in their estimation, the individual being rated falls among a distribution of people in general. In connection with another research project, the writer had developed such a scale covering thirty-six different personality traits, thus providing a relatively complete picture of a given personality. This scale seemed to be ideally designed for the job at hand — that of comparing a given individual's personality as judged by his personal acquaintances with his personality as judged by amateur contacts. It was necessary only to secure the coöperation of amateurs and to collect such ratings from personal friends and from ham friends whom they had never met personally.

Fifty twenty-meter 'phone operators scattered over the United States were contacted by the writer and the purpose of the study explained to them. After he agreed to coöperate, each of the fifty operators was sent eleven copies of the thirty-six-trait personality rating scale. Each was instructed to: (1) send five of the scales to other amateurs with whom he had talked a number of times but whom he had never met personally; (2) give five of the scales to personal acquaint-ances; and, (3) rate himself on the eleventh blank. A mimeographed sheet giving instructions to the raters accompanied each scale, together with a stamped envelope and instructions to return to the writer's office for evaluation.

Although fifty operators originally agreed to

^{*} Department of Psychology, Purdue University, Lafayette, Indiana.

¹At the time this investigation was made, the writer was located at Connecticut State College and held the call W1KCK.

If you have ever wondered what the fellow on the other end of a QSO was like, if you have ever speculated on the personality and traits of other amateurs known to you only over the air, this article is meant for you. The author, by vocation a professor of psychology and by avocation a ham, felt the same wonder. He decided to make a study of amateur reactions to personality and apply predetermined ratings to see what the answer would be. The results here presented are probably to be followed by a more extensive survey. If you receive one of these questionnaires, don't discard it; coöperate with an effort that is worth-while and without ulterior motive.

coöperate, considerable difficulty was experienced in securing enough returns to permit a statistical analysis of the data. It seems that many of the recipients of these scales were inclined to treat them much as they do QSL's, i.e., lay them aside with the best of intentions! Finally, however, at least two amateur and two personal ratings, as well as a self-rating were returned for twenty-seven of the original fifty operators. The writer wishes to express his appreciation both to these amateurs and to their friends for their coöperation in making this study possible.

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For these twenty-seven people, then, there was available a self-rating, the average of from two to five personal friends' ratings and the average of from two to five amateur ratings for each of the thirty-six traits. As has been pointed out above, personal ratings obtained from one set of acquaintances tend to agree with ratings obtained from another set of acquaintances. The relationship between the amateur and the personal ratings showed much lower correlations, indicating in general a lack of agreement between the personal judgments of amateur acquaintances and those of personal friends. This is, of course, a general statement and the closeness of agreement varies considerably according to the trait being judged. For instance, if we assume that the average rating of personal acquaintances constitute what the individual really is, we find that overthe-air judgments are most accurate with regard to ratings of a person's usual disposition, that is, whether he is pessimistic or optimistic, ratings on quietness or boisterousness (quite obvious in many 'phone QSO's!), ratings of pep, or sociability, and, surprising as it may seem, ratings of how religious an individual is. In contrast to these relatively accurate judgments on the part of amateur acquaintances, we find over-the-air judgments show no agreement with ratings of personal acquaintances for these traits: sense of humor, coöperativeness, tolerance, sincerity, popularity, and breadth of interest.

Listed above are the five most accurately judged traits and the five least accurately judged traits. Judgments with respect to the other twenty-six were of somewhat better than chance accuracy, but by and large relatively inaccurate. The question might very well be asked as to whether or not the judgments of personal acquaintances constitutes a satisfactory criterion of the person's

personality. While philosophically it is possible to hypothecate a person's real self as being something entirely different from the impression he makes on his associates, it is nevertheless true that his success or failure is largely dependent upon what psychologists call the "stimulus value of his personality," or the impression he makes on his acquaintances. All that we have done here is determine whether this impression is the same whether for personal, face-to-face acquaintances or for impressions made over the air.

It is possible that the lack of agreement between over-the-air judgments and judgments of personal acquaintances may result from the tendency of an operator to assume a different role when he sits down at the operating table than that which he plays in everyday life. In other words, it is not inconceivable that an amateur's "microphone personality" is really different from that he reveals to personal acquaintances. All of us tend to assume different roles according to the situation in which we find ourselves. The writer, for instance, is a very different person when lecturing to his classes, operating W9EWL, or attending a formal tea!

Another source of possible error in the judgments which we make of acquaintances, both personal and over the air, is the tendency to assume that, because an individual happens to be engaged in a certain occupation or be a member of a certain religious or political group, therefore has the other characteristics which we tend to associate with a given role. For instance, if during your first

(Continued on page 56)



Reactance Calculations With the Lightning Calculator

Extending the Usefulness of the Type A Calculator

BY ROBERT R. BUSS*

THE A.R.R.L. Lightning Calculator is an excellent slide rule for the calculation of coil inductances and resonant frequencies of coil-condenser combinations, and is also useful for converting frequency to wavelength. However, the writer has often wished to know the reactance of a known inductance or capacitance at a given frequency, or the amount of inductance or capacity required to have a known reactance at a given frequency. Since the Lightning Calculator is essentially a slide rule, reactance calculations can be made easily by using the wavelength scale, the frequency scale, and the turns-per-inch scale. For purposes of these calculations, the wavelength scale and the turns-per-inch scale are used only as numbered scales, since the fact that they are labeled wavelength and turns-per-inch does not prevent their being used for other purposes.

Inductive Reactance

Set the culluloid indicator at No. 17 double-cotton-covered and, using the numbers on the wavelength scale to represent micro-henrys, set the value of inductance under the hairline. Notice that the inductance scales are not used. Then move the indicator so that the hairline is over the desired frequency. Then using the numbers on the turns-per-inch scale, under the hairline of the indicator will be found a number corresponding to 1/100 of the inductive reactance of the coil, that is, the reactance of the coil in ohms is 100 times the reading on the turns-per-inch scale.

Example: What is the reactance of 125 microhenrys at a frequency of 2000 kilocycles?

Solution: Set the indicator at No. 17 d.c.c. and using the numbers on the wavelength scale to represent microhenrys set 125 under the hairline (125 μ h). Now move the indicator to 2000 kc. giving 15.7 on the turns-per-inch scale. The reactance is then 100 times 15.7 or 1570 ohms of inductive reactance.

The reverse procedure is used to find the inductance required to have a given reactance.

Example: What inductance has a reactance of 400 ohms at a frequency of 7.2 megacycles (7200 kc.)?

Solution: Set the indicator at 4 on the turns* Heintz and Kaufman, Ltd., South San Francisco,
California.

per-inch scale (reactance/100 = 400/100 = 4), and set 7200 kc, under the hairline. Move the indicator to No. 17 d.c.c. and read the inductance as 8.9 μ h, on the wavelength scale.

Capacitive Reactance

Set the indicator at No. 5 double-silk-covered wire, and set the frequency under the hairline. Now using the numbers on the wavelength scale to represent micro-microfarads, move the indicator to the value of capacity. Notice that the capacity scale is not used. The number on the turnsper-inch scale under the hairline then gives 1/100 of the capacitive reactance, that is, the reactance in ohms is 100 times the reading on the turns-per-inch scale.

Example: What is the reactance of a 100- $\mu\mu$ fd. condenser at a frequency of 5 megacycles (5000 kc.)?

Solution: Set the indicator at No. 5 doublesilk and bring 5000 kc. under the hairline. Now using the numbers on the wavelength scale to represent $\mu\mu$ fd., move the indicator to 100 on the wavelength scale. The number under the hairline on the turns-per-inch scale, 3.18, gives 1/100 of the reactance. The reactance is thus 100 times 3.18 or 318 ohms.

Again, the reverse procedure is used to find the capacity required to have a given reactance at a given frequency or to find the frequency at which a given capacity has a given reactance.

Example: What capacity is required to have a reactance of 1000 ohms at 56 megacycles?

Solution: Set the indicator at No. 5 doublesilk and bring 56 Mc. under the hairline. 1/100 of 1000 is 10, so move the indicator to the number 10 on the turns-per-inch scale, and the reading on the wavelength scale gives the capacity, $2.8 \mu\mu fd$.

Whenever any desired quantity is not on the scale of the Calculator, the problem can be solved by using values of inductance, capacitance, or reactance that have the decimal point shifted one or two places. The answer must be corrected to correspond. Thus if a value of inductance 100 times too large is used, the value of reactance obtained will be 100 times too large.

Example: What capacity is required to have a reactance of only 10 ohms at a frequency of 3.5 Mc. (3500 kc.)?

Solution: Set the indicator at No. 5 double-silk and bring 3500 kc. under the hairline. Since 1/100 of 10 ohms is 0.1 and this figure 0.1 does not appear on the turns-per-inch scale, use the figure 10 instead. This corresponds to 1000 ohms reactance so the capacity as read on the wavelength scale, 45 $\mu\mu$ fd., is 100 times too small. The required capacity for only 10 ohms reactance is thus 100 times 45 $\mu\mu$ fd. or 4500 $\mu\mu$ fd (= 0.0045 μ fd.).

Where these rules are to be used for calculating reactance, it will be helpful to print a letter L next to the line No. 17 d.c.c., and a letter C next to the line No. 5 d.s.c., to mark more clearly these two settings on the Calculator. Concise directions should be typed onto a strip of paper or cut out of the magazine and pasted on to the back of the Calculator so that they can be used easily.

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* NEW * TRANSMITTING TUBES

NEW HIGH-POWER BEAM PENTODE

HEINTZ and Kaumfan announce a new high high-power beam tetrode—the Type HK257—capable of an output of 230 watts with telegraphy at 2000 volts with a driving power of about 2 watts, 178 watts as a plate-modulated amplifier and 35 watts as a supressor-modulated amplifier. The tube is only 6 inches high and 25% inches in diameter. It fits a giant 7-pin bayonet base. Ratings and typical operating values follow.

Gammatron Type 257 Beam Pentode

Electrical data: Plate dissipation	75	watts
Maximum screen input	25	watts
Filament voltage	5.0	volts.
Filament current	7.5	amps.
Interelectrode capacities:		
Plate-grid capacity	0.04	μμfd.
Input capacity	13.8	$\mu\mu fd$.
Output capacity	6.7	$\mu\mu fd$.

Radio-Frequency Power Amplifier - Class "C" Unmodulated

	Max. Rating per Tube	Typi	ical Oper	
Power output		230	170	watts
Driving power		2.1	1.4	watts
D.c. plate voltage	2000	2000	1500	volta
D.c. plate current	150	150	150	ma.
D.c. suppressor voltage		60	60	volte
D.c. suppressor current		5	4	ma.
D.c. screen voltage	500	400	500	volts
D.c. screen current	50	14	11	ma.
D.c. control grid voltage	-500	-180	200	volts
D.e. control grid current	25	9	6	ma.
Peak r.f. control voltage		260	255	volts
Plate dissipation	75	70	55	watts

Radio-Frequency Power Amplifier — Class "C" Plate Modulated
(60% Average Value)

Mar

	Rating per Tube		Туріса	ıl Opera	tion, 1	Tube
Power output		178	143	115	95	watts
Driving power		1.7	1.7	1.7	1.7	watte
D.c. plate volts	1800	1800	1500	1250	1000	volte
D.c. plate current	135	135	135	135	135	ma.
D.c. suppressor volte		60	60	60	60	volts
D.c. suppressor current		4	4	4	5	ma.
D.c. screen volts	400	400	400	400	400	volts
D.c. screen current	40	11	11	11	13	ma.
D.c. control grid volts	-500	-130	- 130	-130	-130	volts
D.c. control grid current	25	8	8	8	8	ma.
Peak r.f. control voltage		235	235	235	235	volts
Plate dissipation	65	65	60	54	40	watte

Radio-Frequency Power Amplifier — Class "C" Suppressor Grid
Modulated

(Maximum Input Watts 110)

	Rating per Tube		cal Car	rier Cone	litions
Power output		35	33	32	watts
Driving power		.4	1.4	2.0	watts
Audio power		100*	100*	500**	milli- watts
D.c. plate voltage	2000	2000	1500	1000	volts
D.c. plate current	100	55	70	90	ma.
D.c. suppressor voltage	-500	- 300	-210	-135	volts
D.c. suppressor current		0	0	3	ma.
D.c. screen voltage ***		500	500	600	volts
D.c. screen current		27	44	41	ma.
Screen dropping resistor		2000	2000	5000	ohms
D.c. control grid voltage	-500	- 130	-130	-130	volts
D.c. control grid current	25	3	8	11	ma.
Peak r.f. driving voltage		150	195	200	volts
Peak a.f. modulating voltage		300	210	175	volts
Plate dissipation	75	75	72	60	watts

Radio-Frequency Doubler Amplifier (Maximum Input 200 Watts)

	Rating per Tube		Typical	Operati	on
Power output		120	110	80	watts
Driving power		.7	1.8	5.5	watts
D.c. plate voltage	2000	2000	1500	1000	volts
D.o. plate current	150	95	120	150	ma.
D.c. suppressor voltage		60	60	60	volts
D.c. suppressor current		2	4	6	ma.
D.c. screen voltage	500	500	500	500	volts
D.c. screen current	50	6	13	25	ma.
D.e. control grid voltage	-500	300	330	400	volta
D.c. control grid current	- 25	2	5	12	ma.
Peak r.f. control voltage		340	400	510	volts
Plate dissipation	75	70	70	70	watts

811 AND 812

RCA ANNOUNCES two new transmitting tubes of interest to amateurs. These are the types 811 and 812.

The 811 and 812 are companion tubes which may be operated at full ratings at frequencies up to 60 Mc, and at reduced input up to 100 Mc.

* Use Type 6C5 tube or equal with 1+2 step-up transformer ratio.

** Use receiving type pentode as 6F6 and 1÷1 transformer ratio.

*** Applied through the indicated screen dropping resistor.

The 811 is a high-mu tube designed primarily for r.f. service, but is also suitable for biased Class-B audio use.

The use of "zirconium-coated" nickel plates in both of these types makes possible unusually high-power capabilities for tubes of such small size. (The envelope size is the same as that of the 809.) The new coating material has high heat-dissipating qualities and excellent "gettering" characteristics. Bases are of a new substance called *micanol*. Both tubes have high perveance and require low driving power. Normal input for Class-B audio or Class-C telegraph service is 450 watts per pair under the new intermittent amateur service ratings. Other ratings and operating conditions are as follows:

	811	812
Filament voltage (a.c. or d.c.).	6.3	6.3
Filament current	4 amps.	4 amps
Amplification factor	160	29
Interelectrode capacities:		
Grid-plate	5.5 μμfd.	5.3
Grid-filament	5.5 µµfd.	5.3
Plate-filament	0.6 uufd.	0.8

Typical Operation

A.F.	Power	Amplifier	and	Modulator - Class	\mathbf{B}	(Two
Tu	bes):					

811	812
1500	1500
-9	-46
145	195
38 ma.	
20 ma.	42 ma.
200 ma.	200 ma.
18,000 ohn	as 18,000
10.5 wat	ts
225 wat	ts
	1500 -9 145 38 ma. 20 ma. 200 ma. 18,000 ohm 10.5 wat

Class-C Telephony, Plate-Modulated

,	811	812
D.c. plate voltage	1250	1250
D.c. grid voltage		-125
D.c. plate current	125 ma.	125 ma.
Grid resistor	2500 ohms	5000 ohms
Peak r.f. grid voltage	230	245
D.c. current approx	50 ma.	25 ma.
Driving power approx	11 watts	6
Power output approx	120 watts	120

Class-C Telegraphy

D.c. plate voltage	1500	1500
D.c. grid voltage:		
From a fixed supply of	-113 volts	-175
From a grid resistor of	3500 ohms	7000
From a cathode resistor of	600 ohms	1000
Peak r.f. grid voltage	225	285
D.c. plate current	150 ma.	150 ma.
D.c. grid current approx	35 ma.	25 ma.
Driving power approx	8 watts	6.5
Power output approx	170 watts	170

New U.H.F. Tube

Hytronic Laboratories have announced final ratings on the HY615 designed especially for ultra-high frequency use in transmitters and receivers at frequencies up to 300 Mc. The 615, a triode, features short connection leads, relatively small internal elements resulting in low interelectrode capacities. Plate and grid leads are brought out in the form of "horns" at the top of

the bulb. The over-all height of the tube is $2\frac{1}{16}$ inches and the diameter $1\frac{5}{16}$ inch. The base is a special 5-pin octal.

The tube may be universally employed as an oscillator, in low-power transmitters or superhet receivers, neutralized r.f. amplifier, bias or gridleak detector or as a self-quenched detector in super-regenerative receivers. Ratings and typical operating conditions are as follows:

Electrical Characteristics

Heater voltage			 								6.3
Heater current											
D.c. plate voltage											300 max.
D.c. plate current					٠						20 ma. max.
D.c. grid current				٠							4 ma. max.
Amplification factor.				4			,				22
Mutual conductance.	,										2200 µmhos.
Plate resistance			٠								10,000 ohms
Plate dissipation			e			٠					3.5 watts

Interelectrode Capacities

Grid to plate		 1.7 μμfd.
Grid to cathode	9	 1.4 μμfd.
Plate to cathod	le	1 7 aufd

R.F. Amplifier and Oscillator, Class C

(Plate-modulated or c.w.)

Typical operation	: 1											
D.c. plate voltage												300 volts
Grid voltage						,	,					35 volts approx.
D.c. plate current	2								,	٠		. 20 ma.
D.c. grid current 2									,			1.4 ma. approx.
R.f. power output	2			٠								. 3.5. watts, approx.

Detector Operation

	Biased	Grid Leak
Typical circuit conditions:		
Plate-supply voltage 3	250	180
Grid voltage	-7 approx.	4
Load resistance	0.25 meg.	0.5 meg.
Self-bias resistor	50,000 oh	me approx.
Plate current	5	8
Grid leak	1 to	5 meg.
Grid condenser		250 uufd.

¹ At 240 Mc. Only moderate reduction in this value will be found for frequencies as high as 300 Mc. Above this frequency, the power output decreases as the frequency increases.

² Subject to wide variations controlled by circuit constants and operating characteristics of associated input and output circuits.

³ This is a plate supply voltage value. The voltage effective at the plate will be plate-supply voltage less drop in load caused by plate current.

4 Grid returns through grid leak to cathode.

⁵ Adjusted to 0.25 ms. approx. with no input signal.

New Receiving Tubes

RCA ANNOUNCES a new series of miniature battery tubes designed particularly for compact light-weight portable equipment. Each tube is only about 2 inches long and 34-inch in diameter. High operating efficiency of these new types at 45 volts has been attained by a new design which provides compactness without decreasing the size of essential electrode parts. This compactness has been achieved by replacing the conventional base with a new glass-button, 7-pin base sealed to the glass envelope and by mount-



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ing the electrodes directly on the glass button. An idea of the size may be obtained from the accompanying photograph.

A special socket has been designed to fit tubes of this series. These sockets have a maximum diameter of 3/4-inch and may be mounted in a 5%-inch diameter hole. The sockets are fastened in any desired position by means of a simple clamping plate furnished with the socket.

The series includes a pentagrid converter, a power-amplifier pentode, a diode-pentode and a variable-mu r.f. pentode.

The filaments are designed to operate directly from a 1.5-volt dry-cell and all except the 1S4, which has a current rating of 0.1 amp., are rated at 0.05 amp.

The pin numbers in the tables of base connections follow the standard RMA system.

Tentative characteristics and operating conditions follow:

IR5 Pentagrid Converter

2 things in Commerce		
Filament voltage		1.4 volts
Filament current		0.05 ampere
Converter Service		
Typical operation:		
Plate voltage	45	90 volts
Grids No. 2 & No. 4 voltage.	45	45 volts
Grid No. 3 voltage	0	0 volt
Grid No. 1 resistor	0.1	0.1 megohm
Plate resistance (approx.)	0.6	0.75 megohm
Conversion transconductance	235	250 micromhos
Grid No. 3 bias (approx.) for convs. trans-		
cond. = 5 \(\mu\text{mhos}\)	-9	-9 volts
Plate current	0.7	0.8 milliampere
Grids No. 2 & No. 4 current	1.9	1.8 milliamperes
Grid No. 1 current	0.15	0.15 milliampere
Total cathode current	2.75	2.75 milliamperes

nections

Pin Conn
Pin 1 - Filament (-), Grid No. 5
Pin 2 — Plate
Pin 3 — Grids No. 2 & No. 4
Pin 4 Grid No. 1
Pin 5 — Filament (-), Grid No. 5
Pin 6 — Grid No. 3
Pin 7 — Filament (+)

184	
Power Amplifier Pentode	
Filament voltage (d.c.)	1.4 volts
Filament current	0.1 ampere
Amplifier - Class A1	
Typical operation and characteristics:	
Plate voltage	45 volts
Screen voltage	45 volts
Grid voltage *	-4.5 volts
Peak A-F grid voltage	4.5 volts
Zero-signal plate current	3.8 milliamperes
Zero-signal screen current	
Plate resistance (approx.)	
Transconductance	
Load resistance	
Total harmonic distortion	12 per cent
Maxsignal power output	0.065 watt
Pin connections	
Pin 1 — Filament (-), suppressor	
Pin 2 — Plate	
Pin 3 — Grid	
Pin 4 — Screen	
Pin 5 — Filament (-), suppressor	
Pin 6 — Plate	
Pin 7 — Filament (+)	

Pin 2 — Plate	
Pin 3 — Grid	
Pin 4 — Screen	
Pin 5 — Filament (-), suppressor	
Pin 6 — Plate	
Pin 7 — Filament (+)	
185	
Diode-Pentode	
Filament voltage (d.c.)	1.4 volts
Filament current	0.05 ampere
Characteristics of Pentode Unit	
	45 volts
Plate voltage	45 volts
Screen voltage	0 volts
Grid voltage	0.5 megohm
Plate resistance (approx.)	5.25 microhmoss
Transconductance	1.2 milliampere
Screen current	0.3 milliampere
screen current	0.5 miniampere
Pentode Unit - Class A1 Amplif	ier
Plate voltage	90 max. volts
Screen voltage	90 max. volts
Plate dissipation	0.06 max. watt
Screen dissipation	0.025 max. watt
Typical operation as resistance-coupled amplifier:	
Plate-supply voltage	41 volts
Screen-supply voltage	41 volta
Control-grid voltage *	0 volts
Plate-load resistor	1 megohm
Series screen resistor	3 megohms
Screen by-pass condenser	$0.1 \mu \text{fd}$.
Control-grid resistor	10 megohms
Voltage gain † (approx.)	30

Diode Unit

The diode is located at the negative end of the filament, and is independent of the pentode unit except for the common filament.

Pin Connections

	A see destructions
Pin 1 - Filament (-),	pentode suppressor
Pin 2 - No connection	
Pin 3 — Diode plate	
Pin 4 - Pentode screen	
Pin 5 — Pentode plate	
Pin 6 - Pentode grid	
Pin 7 - Filament (+)	

				1.78				
	Super-	Contro	R.F	. Am	plifie	r Peni	tode	
Filament vo	oltage (d.c.)						1.4 volts	
Filament co	irrent						0.05 ampere	

* Referred to negative filament terminal. † Obtained when the grid of the pentode unit is fed from a source having an impedance of 1.0 megohm. (Continued on page 90)

Q Measurements

The Home Measurement of Coil Merit Factor

BY C. B. STAFFORD, WOKWP

MEASUREMENTS of coils have a definite place in every radio engineering laboratory, and many of us have enough equipment to make comparable measurements in our own labs. Sometimes an apparently good coil will show no gain when placed in a receiver. By Q measurements, we may determine whether the coil is at fault. The merit of winding a coil on different form materials is of interest. Other applications will suggest themselves to those who become familiar with Q measurements.

Accurate Q measurements usually require a good deal of expensive equipment. However, most of us have enough equipment in our junk boxes to make comparative measurements. If all of the measurements are made on the same pieces of equipment, the relative values of the several coils measured will be determined. In experimental construction, this is as valuable as the

absolute Q.

Definition

The figure of merit of a co $\hat{\mathbf{u}}$, commonly denoted by the symbol Q, is defined as being equal to the inductive reactance divided by the resistance, or

$$Q = \frac{X_L}{R} = \frac{2\pi f L}{R} \tag{1}$$

In this definition, as in many others in electrical engineering, R represents not only the direct current resistance of the circuit, but also the lumped losses represented by the core and dielectric losses. Q is in a general way a measure of the efficiency of a coil. It is proportional to the ratio of the inductance — that part which is desired to the losses. In a transmitter it partially determines the power output of the plate circuit. In a receiver, it is a vital factor in determining the selectivity, image ratio, and signal-to-noise ratio. It influences the voltage which will develop across the tank condenser in an amplifier. And last, although the list is far from complete, it determines the lowest voltage at which the oscillator of a superheterodyne will function.

If Q is determined by the use of the defining equation, the result is of little value due to the inaccuracies inherent in the simpler determinations of L and R. In order more clearly to understand the problem, this type of Q measurement will be illustrated. The first discussion will be followed by simpler and more accurate methods.

As an example of the direct application of the

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defining formula, let f=60 cycles per second, L=2 henries, and R=100 ohms. Then (App. 1) Q will be 7.54. In an air core coil for audio frequencies, in which R is approximately equal to the direct current resistance, the above method might be used to determine Q. Although beyond the scope of this article, there are better and more accurate ways of measuring the Q of audio frequency coils than the one above.

Suppose now that we wanted to use this same method to measure the Q of a radio-frequency coil. We would be unable to determine easily the correct value to use for R, and other errors would appear when we measured the inductance by the most obvious method. Because this matter of inductance measurement will be useful in a

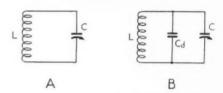


Fig. 1 — A simple resonant circuit is shown at A, while B shows the distributed capacity represented as a separate condenser.

method of Q measurement taken up later, it will be discussed rather completely.

Perhaps the most common method of finding the inductance, which is required for the computation of Q by the direct method, is to connect the unknown inductance in parallel with a known capacity and determine the resonant frequency of the combination. This requires either a known frequency and a calibrated condenser, or a calibrated variable frequency source and a known fixed condenser. Since $f = \frac{1}{2\pi\sqrt{LC}}$, we may

solve for L and write

$$L = \frac{1}{4\pi^2 f^2 C} \tag{2}$$

This equation applies when the units are henries, cycles per second, and farads. Using the more common units of microhenries $(L = \mu h.)$, kilocycles (f = kc.), and micromicrofarads $(C = \mu \mu fd.)$,

$$L = \left(\frac{159,160}{f}\right)^2 \frac{1}{C} \tag{3}$$

Using this formula, and knowing the capacity and the frequency, we may solve directly for the

inductance in microhenries. The numerous graphs and slide-rules for the determination of L, C, or f, when the other two are known, are based upon this equation. As an example of this method of solution, let us suppose that a certain coil tunes to 600 kc. with an external capacity of 410 μμfd.

Substituting these values into (3), we find $L = 171.6 \mu h$. (App. 2). We shall say that the inductance thus found is that indicated by the single frequency method at 600 kc., and we shall

label this value $L_{600} = 171.6 \ \mu h$.

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If this equation is true, we should be able to employ the same method at some other frequency and obtain the same answer. Doing this, we find that this coil requires 80 $\mu\mu$ fd. to tune it to 1200 kc. This sounds, and is, reasonable, as it takes less capacity to tune a coil to a higher frequency. Substituting these new values into (3), we find $L_{1200} = 219.9 \ \mu h.$ (App. 3). Most embarrassingly, this value for L at 1200 kc. is not the same as the one obtained at 600. Not only are we stumped in not yet having determined the value for R, but it looks as if our determination of L is also questionable. Our discrepancy of 48.3 µh. is really serious. Assuming the lower inductance to be correct, there is an error of 28.1%. In these days of accuracy of one part in millions, such an error is inexcusable.

A reasonable assumption is that we have not included all of the elements of the circuit. We started with two known values, the external tuning capacity and the resonant frequency. With broadcast stations all around us, there is little reason for frequency error, so we must have erred in our capacity measurement. As a starting point, let us assume that there is some unknown fixed capacity shunting our standard condenser. Let us replace all stray capacities by one fixed capacity. The circuit assumed in the two examples given is shown in Fig. 1-A. Fig. 1-B shows the circuit which we shall assume to exist in the following derivation.

Applying (2) to the circuit of Fig. 1-B, we find $L = \frac{1}{4\pi^2 f^2 (C_d + C_x)}.$ This is true since the total

How good are the coils you've been using in your rig? If you have an e.c.o. and a vacuum-tube voltmeter you can measure their Q's as pretty as you please. Don't let the equations scare you - you don't have to know one bit of math to get the idea.

capacity C is equal to the sum of the component capacities C_d and C_z . This applies to the general case. If we now take the two special cases of two different frequencies, indicated by f_1 and f_2 , tuned to resonance by their respective capacities, C_1 and C_2 , plus the common fixed capacity C_d , the following equations are obtained:

$$L = \frac{1}{4\pi^2 f_1^2 (C_d + C_1)}$$
 (4a)

$$L = \frac{1}{4\pi^2 f_1^2 (C_d + C_1)}$$

$$L = \frac{1}{4\pi^2 f_2^2 (C_d + C_2)}$$
(4a)

All of the values but L and C_d are known in these two simultaneous equations, and we may therefore effect a solution. Setting (4a) equal to (4b), and solving for C_d , we find (App. 4)

$$C_{\rm d} = \frac{f_2^2 C_2 - f_1^2 C_1}{f_1^2 - f_2^2} \tag{5}$$

Now we have obtained a formula for determining any fixed shunting capacity associated with the coil being measured. This in itself is a useful formula for it permits us accurately to measure the distributed capacity of a coil. The adjacent and/or overlapping component lengths of the turns of a coil form condensers. Their total capacities are generally considered constant for any given winding. If the two frequencies used above differ by a ratio of two to one, as in the examples given, the resulting error is negligible.

Since we know C_d in terms of f and C, we may simplify either (4a) or (4b) and solve for L (App.

5). Using the common units (App. 6), we find
$$L_{\mu h} = \frac{(f_1^2 - f_2^2) \times 10^{12}}{4\pi^2 f_2^2 f_1^2} \times \frac{1}{C_2 - C_1}$$
 (6)

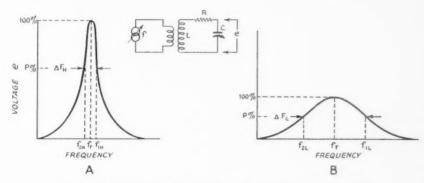


Fig. 2 — Resonant curves of a high-Q circuit (A) and a low-Q circuit (B).

January 1940

If one uses the same two frequencies for the majority of the measurements, the factor multiplying

- can be once determined and remembered $C_2 - C_1$

or recorded as a constant. Table 2 shows a number of useful values. In (6) it makes no difference which subscript is used to denote the higher or lower frequency, so long as it is used the same

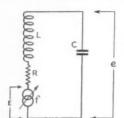


Fig. 3 — The equivalent circuit of the insert of Fig. 2.

way for both the capacity and frequency. If an error is made in this respect, the resulting value of L will be negative. It should be noted that although this equation is derived from (2), it is considerably different in appearance. (6) is the correct one to use when one does not know the total capacity which is tuning the coil. The error made in the examples was caused by the assumption that the external capacity was the only capacity present. Most coils would not have a distributed capacity as high as the coil used for an example.

Employing the values already given for 600 and 1200 kc., we find the inductance to be (App. 7) $L_{1200-600} = 159.9 \,\mu h$. This is the true inductance of the coil. Table 3 gives the calculated inductance versus the method of calculation. From this the conclusion may be drawn that, for a given coil, the lower the frequency the more accurate will be the determination of the inductance by the single frequency method. This is reasonable to assume, since the lower the frequency the greater will be the capacity which is necessary to tune the coil to resonance. The distributed capacity is treated as a constant and, as the total capacity increases, the distributed capacity, and consequently the error, becomes a progressively smaller percentage of the total capacity. Therefore, at a sufficiently low frequency, Cd may reasonably be neglected.

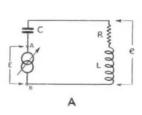
If we could determine the effective total resistance, we would be able to calculate the $\mathcal Q$ of the coil. But it is even more difficult to determine the value of R at radio frequencies than it is in the audio range, so we are again stumped. So the problem must be approached from another angle.

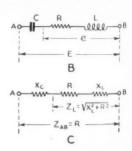
Band-Width Method

Perhaps the most accurate method of measuring Q is the band-width method. The shape of the resonance curve of a coil and condenser is partially determined by the Q of the circuit. Since the losses in the condenser are generally negligible. we may say that the shape of the resonance curve is governed by the Q of the coil. If the coil has a low Q, the curve will be wide and flat. If the coil's Q is high, the curve will be high and narrow. Fig. 2 shows the curve of the voltage developed across a coil and condenser plotted against the frequency impressed upon it. The insert shows the circuit used to determine the curve. A constant voltage of variable frequency is impressed on the coil by a loosely-coupled primary, and the voltage is measured across the resonant circuit. As the impressed frequency approaches, passes through, and exceeds the resonant frequency of the circuit, the voltage across the coil will rise to a peak and then fall. From inspection of the figure, it may be seen that ΔF is defined as the difference between the two frequencies at which the output voltage is P% of the peak voltage. The additional subscripts in Fig. 2-A and 2-B indicate the high (H) or low (L) Q curve. It should be noted in Fig. 2-B that ΔF for a lower Q coil is much greater than for a high Q coil. This term ΔF is known as the band-width of the resonance curve. From inspection of the figures, it appears that, if a proper and convenient value is assigned to P, and since the Q of a circuit is apparently some function of the band-width, this characteristic might be used to determine Q.

Let us first assume that the reactance at the point where the voltage is P% of the peak value is equal to the resistance, of X=R. Over the narrow range of frequencies employed in a single Q measurement, we may assume that the coupling, and therefore the voltage which develops across the coil, remains constant. With this in view, we may redraw the circuit shown in Fig. 2-A and place the generator in the secondary. This is

Fig. 4 — The circuit used to show the relation between Q and voltage gain (A), redrawn for impedance analysis (B), and shown in terms of impedance (C).





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TABLE I

Symbols and Abbreviations

Capacity

- Distributed capacity

Voltage — fixed for any one measurement Voltage — varies with adjustment during measurement

Frequency

- % voltage, when R = X, is of resonant voltage

- Figure of merit

- Resistance representing losses in the circuit

XL - Inductive reactance

- Capacitive reactance

Impedance

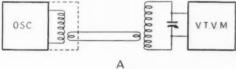
Small change or difference in the factor indicated

shown in Figure 3. From inspection we see that this is merely a series circuit composed of R, L, C, and a variable-frequency constant-potential generator. Since the impedance of the circuit is $Z = \sqrt{R^2 + X^2}$ at resonance, when the reactance X is zero, $Z_r = \sqrt{R^2} = R$. At P% down, when R is equal to $X, Z_1 = Z_2 = \sqrt{R^2 + R^2} = \sqrt{2}R$. Apply-Ohm's Law for alternating current, I = E/Z,

$$I_t = \frac{E}{R}$$
 and $I_1 = I_2 = \frac{E}{\sqrt{2}R}$

In view of the fact that the frequency is varied over such narrow limits, the reactance of the condenser in the circuit may be treated as a constant. If such is the case, the voltage e across the condenser is proportional only to the current flowing through the circuit. Using the values above to obtain the ratio of the voltage at P%down to the voltage at resonance

$$\frac{e_1}{e_r} = \frac{I_1}{I_r} = \frac{\frac{E}{\sqrt{2}R}}{\frac{E}{R}} = \frac{1}{\sqrt{2}}$$
 (7)



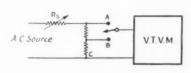


Fig. 5 — Circuit used with the band-width and capacity methods of Q measurement. The oscillator r.f. circuit need only be shielded in cases where the vacuumtube voltmeter picks up signal from the oscillator by radiation. B shows the v.t.v.m. calibrating circuit (see text).

$$e_1 = \frac{e_r}{\sqrt{2}}$$
 or $P = 70.7\%$

This says that when the resistance and the reactance are equal, the voltage across the parallel circuit will be 70.7% of the voltage at resonance. Let us now apply this information to the evaluation of Q.

For fixed values of L, R, and C, as shown in Fig. 3, we may say that the capacitive and the inductive reactances change the amount between the limits of f_1 and f_2 as previously defined. A general proof of this is given in item 8 of the appendix. Since the total change in reactance as



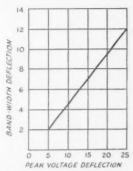


Fig. 6 — Table and graph for finding deflection equivalent to 70.7% of the input voltage necessary to produce any given deflection.

the frequency is varied slightly is equal to the sum of the changes in inductive and capacitive reactances, and since these two are equal, the total change is equal to twice the change of either of the components. The change in inductive reactance is $\Delta X_{\rm L} = 2\pi\Delta f L$. The total change is, therefore,

$$\Delta X = 2\Delta X_{\rm L} = (2)(2\pi\Delta f L) = 4\pi\Delta f L \qquad (8)$$

The total change of frequency is $\Delta f = f_r - f_2 =$ $f_1 - f_r$. We may now rewrite (8) as

$$\Delta X = 4\pi (f_r - f_2)L = 4\pi (f_1 - f_r)L \tag{9}$$

Since at resonance the reactance is zero, we may say that ΔX , which is the change in reactance (from zero) as we go to either f_1 or f_2 , is equal to the total reactance at either of these frequencies. From this we may write

$$4\pi (f_r - f_2)L = \Delta X = X = R 4\pi (f_1 - f_r)L = \Delta X = X = R$$
 (10)

Adding the above two simultaneous equations (App. 9), we find

$$f_1 - f_2 = \frac{R}{2\pi L} = \Delta F$$
 (11)

Dividing both sides of (11) by f_r

$$\frac{\Delta F}{f_r} = \frac{R}{2\pi f_r L} = \frac{1}{Q} \text{ or } Q = \frac{f_r}{\Delta F} = \frac{f_r}{f_1 - f_2}$$
 (12)

This expression, (12), is actually used for measuring Q. From this we may say that Q is equal to (Continued on page 106)



NAVAL COMMUNICATION RESERVE NOTES

The First Naval District

The Naval Communication Reserve of the First Naval District has on its roster list 590 enlisted men and 67 officers. Many of the members of this N.C.R. group are active amateurs owning and operating their own radio stations. The greater part of these officers and men are engaged in the communication or allied fields and the enrollment presents an excellent cross section

of present-day communication.

The First District Naval Communication Reserve is based at the Boston Navy Yard in a building recently modernized and devoted entirely to Naval and Marine Corps Reserve activities. The first floor of the building offers an excellent place for drilling, lecturing or general assembly and is capable of accommodating over 1000 men. On the floor of this assembly hall is painted the outline of a destroyer deck, marked off as to frames, and having a raised platform at one end, representing the bridge of a ship. This drill area is available to Naval Communication Reserve as well as to the other Reserve organizations.

The third floor of the Reserve building houses the master control station NDA, which has been completely remodeled and modernized during the past summer. Antennas are available for several frequencies by a system of selective switching. Operating positions are available, each with its keying control and headset outlet. As this article is written, a new transmitter is being installed. The frequency range being from 2000 kcs., to 8000 kcs., and the output being 150 watts. A commercial type Hallierafter type S-22 for longwave work and a crystal-filtered SX-15 receiver for Naval frequency operations have been installed during the past year.

Adjacent to NDA is the N.C.R. Staff Head-

quarters where staff meetings are held throughout the year on the first Thursday of each month. Staff meetings are supplemented by instructional meetings on the third Thursday of each month from September through June. The current instructional course promises to be outstanding. Naval Communication Reserve Instructional Officer, Lieutenant George H. Burrows, U.S.N.R., has arranged for Commander E. B. Robinson, U. S. Navy, to give a series of eight monthly lectures, beginning in October. Commander Robinson is Senior Instructor, U. S. Naval Reserve, for the First Naval District.

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Considerable space has been given in QST to the general organization of the Naval Communication Reserve in various naval districts, therefore it will suffice to outline briefly the current organization. The District consists of the states of Maine, New Hampshire, Vermont, Massachusetts and Rhode Island. The Naval Communication Reserve in this territory is subdivided into seven Sections, each Section being composed of several Units. There are at present a total of thirty-six Units which completely cover the major portion of the New England States, with the largest membership in the coastal areas. Consistent with the Navy Department's policy, a system of rotation of duty for Staff Officers has been put into effect by the N.C.R. Commander. Lieutenant Commander Raymond B. Meader, U.S.N.R. As of 1 September, 1939, the First Naval District N.C.R. Staff is as follows:

Lieut. Comdr. W. H. Miller, USNR — Material Officer, Lieut. M. D. Chace, USNR — Personnel Officer. Lieut. G. H. Burrows, USNR — Instructional Officer. Lieut. H. D. Kaulback, USNR — Operations Officer. Lieut. L. G. Cumming, USNR — Editor of N.C.R., Information.

Lieut. (jg) A. E. Linell, USNR — Executive Officer. Lieut. (jg) N. L. Abbott, USNR — Security Officer. Ensign W. S. Rogers, USNR — Supply Officer.



Alternate Control Station, NDR, Portland, Me. Ensign T. F. Courneen, U.S.N.R., is officer in charge. Section Commanders are included in the following list:

Section One, Maine — Lieut. N. C. Little, USNR (W10R).

Section Two, New Hampshire — Lieut. R. T. Smith, USNR (W1LBD).

Section Three, Northeastern Massachusetts — Lieut. (jg) R. W. Hart, USNR (W1AAE).

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Section Four, Southeastern Massachusetts — Ensign D. M. Stanier, USNR (W1EOZ).

Section Five, Cape Cod, Massachusetts — Lieut. A. E. Snow, USNR (W1RZ).

Section Six, Rhode Island — Lieut. (jg) H. Young, USNR (W1CAB).

Section Seven, Western Massachusetts — Lieut. (jg) C. J. Green, USNR (W1ASU).

Sections and Units are active throughout the year and during the nine months' period from 1 September to 1 July, the Naval Communication Reserve sponsors an annual radio competition patterned after the national competition. The active drill season terminates with the award of a trophy each June. Every year a military drill competition is held, the winner receiving the District Military Efficiency trophy.

The training program for the Naval Communication Reserve includes not only procedure practice by means of radio drills, but also military drill and instruction in duties aboard ship. Active duty at naval stations and on board ships of the Navy is provided each year for the personnel to the extent which funds and equipment permit. During the past summer, 21 officers and 57 enlisted men of the Naval Communication Reserve have performed tours of training duty, usually of two weeks' duration. This duty was in many cases on board ship and in other cases at the Naval Radio Station, Boston, Naval Reserve Aviation Base, Squantum, and at Direction Finder Stations of the First Naval District.

Much has been written about the very fine work carried on by Naval Communication Reserve Sections Five, Six and Seven of the First Naval District, during the hurricane of 1938, and details will be omitted from this article. Suffice it to say that official recognition and much publicity was given to the very valuable work performed by Section Commander A. E. Snow, U.S.N.R., on Cape Cod, Section Commander H. Young, U.S.N.R., in Rhode Island, and Section Commander C. J. Green, U.S.N.R., in central and western Massachusetts.

It is felt that the interest of many amateurs in the Navy is being stimulated by current conditions. The Naval Communication Reserve of the First Naval District will welcome inquiries from amateurs and others as to the qualifications necessary for enlistment. Information may be obtained from the Personnel Officer, Lieut. Myron D. Chace, U.S.N.R., at 74 Grand View Road, Arlington, Massachusetts.

The Triangle Antenna

(Continued from page 21)

we have averaged one QSO per 2.93 calls whereas with the old antenna — a two-wavelength horizontal Hertz about 40 feet high — we averaged one QSO per 5.22 calls. At the same time the incomplete QSO's dropped from 39% to 22%. The calls were all of the same nature — stations we heard, interspersed with a few CQ's of our own — and are entirely comparable. This change has not been wholly due to increased radiation but due to the combined effects of increased radiation and better receiving conditions. The increase of signal strength and the decrease of QRM is most noticeable.

We haven't worked any foreign DX with the array although we did manage to get a few tests from VE's before they were closed down. The final input here runs from 35 to 70 watts depending upon the load on the local power lines, and all work has been on c.w.

Several speculative points are worthy of mention in connection with the triangle array. One is the effect of the idle antenna. Before we built the array we did a bit of theorizing and even ventured a few predictions as to its probable effect. We have, however, been unable to verify any of our predictions so will have to say simply that we do not know what effect, if any, the idle antenna has.²

In the matter of feeding the array, it seems that a single open-wire line with remotely-controlled relays at the base of each antenna for switching and phasing would be the most desirable system. The losses in the present twisted pairs are probably considerable. Feed lines must be of equal lengths to the matching sections to insure proper phasing. Feed systems for vertical radiators have been adequately discussed in the A.R.R.L. Handbook and QST.³

The triangle array may be used on the lower frequency bands where rotary antennas are impractical. Using quarter-wavelength Marconi units, the array may be used on 40 and 80 meters without going to excessive heights and possibly even on 160 meters if top-loading ⁴ is employed. The triangles will, of course, be larger. Multiband operation is also possible, although the beams will change relative position and shape as the triangle becomes an integral number of wavelengths on a side.

We wish here to thank the fellows who tested with us and to invite anyone with an inclination toward experimentation to give the triangle array a trial.

² It might be worth while to short the feed line of the unused antenna at the station end, to detune it and reduce its pickup and consequent interference with the pattern.

— En

Lynch, "Feeding Vertical Antennas," QST, Jan., 1939.
 Ferrill, "Simple Vertical Antennas," QST, Feb., 1939.

How Emergency Coördinators Work

Their duties, and agencies served—Assistants and committees, assignment of responsibilities—A.R.R.L. Coördinators members of Red Cross committees—More Coördinators and Emergency Corps Members Invited

BY ROY C. CORDERMAN*

Some years ago, to more effectively organize amateurs for operation in disasters and to represent our amateur service abilities properly to the public and to the agencies in each locality, the American Radio Relay League adopted a policy which called for appointing "Emergency Coördinators" in each community.

Prior to the actual emergency, A.R.R.L. Coördinators register the equipment of all local amateurs in a city, as well as contact all the organizations that logically might require help from amateurs in reaching some point outside the affected area. In time of disaster the American National Red Cross assumes responsibility for family relief under the authority as stated in its Congressional Charter which outlines the disaster responsibility of the Red Cross, "To continue and carry on a system of national and international relief in time of peace and to apply the same in mitigating the sufferings caused by pestilence, famine, fire, floods, and other national calamities, and to devise and carry on measures for preventing the same." The local chapter of the Red Cross, aided by its National Organization, takes charge of family relief immediately. The Chapter will be in constant touch with its national headquarters to advise the extent of the disaster and the kinds of material, financial and personal assistance required. If ordinary communication channels have been destroyed, this Red Cross report is likely to come to the amateur for transmission. If the amateur has previously made the acquaintance of the Red Cross people he will know it is an official message, otherwise he should ask the one sending the message to identify himself. It will naturally be followed by a reply from the outside stating how soon assistance can be expected.

The civil government of the community, the head of which may be a mayor, a board of county commissioners, a police chief, etc., may also require assistance, and communications from such officials to a state government may also come to an amateur to handle. When the civil government fails to function due to death of the leaders or other inadequacy, the National Guard will be called upon to preserve order and safety. There is always the possibility it may require amateur assistance to supplement its own communica-

tions. It is well for Coördinators to be acquainted with all agency officials before an emergency arises

Besides the Red Cross and the government agencies, there are other organizations we may serve with whom coöperative steps should be taken during an emergency. These include the public utilities such as power companies, telephone and telegraph companies, railroads and airlines. These organizations in general have their own communication channels or lease such channels and in the event of the loss of these channels during a disaster, assistance would be necessary until such time as their own channels could be restored. In fact, radio contact may serve vitally in aiding to restore other channels of communication needed by the public.

In each community certain other organizations customarily assist in communications work during an emergency. These include broadcasting stations, Boy Scouts, the American Legion and the newspapers of the community. Although the means by which they would accomplish their assistance may be quite different from that of the amateur whose specialty is point to point, two-way communication, the objective would nevertheless be the same, and coöperation can make the accomplishment of the objective easier for all

The general public also calls on amateurs to send word to relatives, friends, neighbors and acquaintances. These requests must be controlled to prevent congestion of amateur channels at any time when there is agency and official traffic to take care of. In the latter stages of general emergency, as wire service is being restored, amateurs often win fine public approbation through handling this secondary traffic. An advance organization setup that will permit the amateur to refer his friends to some central point for assistance or for filing messages for deferred transmission will prevent this congestion. Every Red Cross chapter has a sub-committee on "registration and information" with responsibilities for answering inquiries of relatives, friends, and others about the welfare of persons in the disaster area. There is needed, then, close cooperation with the Red Cross for prompt handling of such requests received by the amateur. It should be arranged to have these messages go through the Red Cross or through one of the telegraph companies either

^{*} Regional Emergency Coördinator (Potomac Valley) W3ZD, 4401 Leland St., Chevy Chase, Md.

of which would be quite willing to set up a central point for the collection of personal messages. As was mentioned in October QST "... traffic will not in general come from or through any one source or agency. Priority will be determined for each dispatch filed by any or all agencies on the principle of the greatest good of the greatest number, and in view of the public interest involved."

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The leadership of each Coördinator requires contact and understanding with all others locally having means of communication, or needing amateur facilities in order to correlate available channels, to aid in routing any message to any particular point effectively. Most of all, however, coördination of amateur facilities and groups is necessary, and in a body as large as amateur radio this is in itself a major problem. Emergency Coördinators are urged by A.R.R.L. to become acquainted with Route Managers. P.A.M.'s, net control operators in A.A.R.S. groups, unit and section commanders in the N.C.R. and others, in order to enlist their active advance collaboration in plans and in order that all regular facilities and circuits may be known and fitted into emergency communication plans that will utilize each station and circuit effectively. In fact "Liaison" Coördinators in A.A.R.S. and certain N.C.R. groups assist tremendously in promoting smooth coördinated communications setups and planned operating to serve the public interest in event of emergency.

A.R.R.L. Emergency Coördinators in most cities appoint Assistant Coördinators specializing in work in different amateur bands to aid in registering and mobilizing amateur facilities for the whole amateur service, and constituting a committee to plan. The Coördinator and/or the committees should, wherever possible, assign definite duties to certain persons, for any contingency. For example, in Washington, we have one person who is responsible for emergency station equipment; another, for emergency station personnel; another, responsible for gasoline driven power units which can be used with fixed stations; and finally one who acts as recorder or secretary to our group.

The creation of interest in his program prior to an emergency is perhaps the greatest problem which an Emergency Coördinator will encounter.

Unless his community has gone through emergencies, the attitude too often is, "It couldn't happen here." A method which has been followed in the Washington area and which has been quite effective started with the preparation and distribution of a directory of organizations, which would require, would assist in the furnishing of. or which would have an interest otherwise, in emergency communications. This directory after the initial issue was revised at six-month intervals with the addition of the names of such other organizations as had been located, and the needed corrections to bring it up to date. Copies of the directory with an explanatory letter were sent to the newspapers and press releases regarding it developed a certain amount of general public interest. After several directories had been distributed, a "get acquainted" meeting of representatives from the various listed organizations was called. Arrangements were made with the Red Cross to use the District Chapter Auditorium. Although the stated objective of this meeting was to become acquainted, a presentation and discussion of the problems which each of the organizations expected might arise during an emergency was made by each of the representatives when he was called upon. The newspapers were represented by reporters at this meeting and the publicity which followed, not only properly recognized the Coördinator, but lent aid to his efforts in preparing his community to meet a communication emergency, and obtaining fullest amateur coöperation and registrations.

The District of Columbia Chapter of the American National Red Cross, understanding the need for communication coördination, invited us to become a member of its chapter Transportation and Communication Committee for disaster relief and in our local case also to act as vice-chairman of this committee for radio communication. Many chapters will have two committees, one for Transportation and one for Communication, which is optional. The new disaster instruction manual within the Red Cross organization includes a recommendation that bears directly on amateur participation. After referring to the desirability of enlisting amateur operators in emergency communication plans and test drills, the manual reads:

A.R.R.L. SCM's, at this writing, are expanding the League's field organization and public service, by appointing additional Coödinators for coverage of as many cities and towns as possible. This timely article, by a Coördinator, tells how Coördinators work, points to the need of the amateur service for Coördinator-representation in every community. Can you help cover a point not already covered? Has a Coördinator been appointed in your city? Are you registered in the Emergency Corps? Do you have its identification card? Coördinator appointments are made by SCM's. Information from SCM's or Hq. on request.

— Communications Manager.

The American Radio Relay League has designated Emergency Coördinators in many communities to unify the service of amateur radio operators for emergency communication. The Emergency Coördinators should be made a part of the Sub-Committee's plans.

The Sub-Committee, through the representatives of commercial communication companies and amateur radio operators, should coördinate means for receiving and transmitting all Red Cross messages so that emergency traffic will receive priority. The plan may include a message center maintained under the control of the Sub-Committee through these representatives.

With this more definite place on Red Cross committees for A.R.R.L. Emergency Coördinators, organization work in so far as the local community is concerned should be much easier for all than it has been in the past. The Red Cross has been through thousands of emergencies, and in recent years it has found its communication problems considerably reduced in those communities where League Coördinators have been on the job.

A final word to the amateurs who live in a community which has no Coördinator. Contact the League at once regarding your community, giving your name as a candidate for Coördinator or giving the name of some other amateur who you know to be a leader. First of all, every licensed amateur should register his facilities in the A.R.R.L. Emergency Corps. A postal to Hq. will bring the Form 7 blank. In each county, some Coördinator must represent the League and the amateur service on the Red Cross Committee handling communications problems. Your neighborhood in its entire history may never have had an emergency, but one can never tell when one may come. "It can happen there!"

Personality Over the Air

(Continued from page 43)

QSO with a brother ham he tells you that he is a banker and you were asked to rate his personality immediately afterward, you would undoubtedly rate him as possessing the characteristics which you attribute to most bankers. Your rating of him as a personality would probably be quite different had he told you he was a grocery clerk or, let us say, a policeman. Inasmuch as a person's occupation is usually one of the first personal bits of information exchanged between amateurs, it is quite likely that this factor influenced the ratings unduly.

If the personal and amateur ratings do not agree very closely, what about a comparison of self-ratings and those of the two types of acquaint-ances? Self-ratings by the twenty-seven amateurs were found to show but little agreement with ratings by either of the two groups of acquaintances. In other words, an amateur may consider himself to be such-and-such, his personal acquaintances regard him as something else, and the impression which he gives over the air is still different. How-

ever, the relationship between self and personal ratings is closer than between self and amateur ratings. It is interesting to note that the traits showing the most agreement for self and amateur ratings are "pleasantness of voice," "quietness-boisterousness," "generosity," and "conventionality." Even for these traits, the agreement is not very close. We must conclude either that amateurs do not give the impressions over the air which correspond to their evaluations of themselves, or that they were not frank in their self-estimates.

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I am sure all amateurs will also be interested in the question of whether or not these twenty-seven amateurs as a group were rated by their personal acquaintances as markedly different from any other group of the population. In other words, are amateurs the peculiar sorts of individuals they are sometimes considered to be? In this connection, the data are quite flattering. As a group, these twenty-seven amateurs are rated as superior to a group of thirty-eight college men on twenty of the thirty-six traits and inferior on only six. In most cases the superiority is not great, but the direction and amount is enough to suggest that this group of twenty-seven Class-A amateurs represents a distinctly superior group of the general population. For instance, they were rated as better adapted to social situations, more friendly. more punctual, more cooperative, more persistent, more honest, more optimistic, more sincere, more entertaining, and more dependable than the college men with whom a comparison was made.

Lest the picture be too flattering, it should be added that the group is inferior to the college men in that they were rated slightly less handsome, considerably less religious, somewhat less courteous, somewhat poorer dressers, as having more narrow interests, and as less conventional than the average college man. Just how serious these defects are and whether they are more than offset by the favorable ratings is left to the reader to judge.

Many factors prevent this from being a conclusive study. The number of cases studied is much too small and at least five ratings by personal acquaintances and five by amateur acquaintances should have been available for each person. Of the total of 550 scales sent out, less than half were ever returned for evaluation. Some amateurs report that their operating is so irregular that they do not really know five brother amateurs well enough to ask them for a rating. Then, too, it must be admitted that many amateurs do not take advantage of the opportunity which our hobby offers for making new acquaintances. "Your signal is a 5, r 9 plus, - rig here is a 6A6 crystal — etc." does not enable one to learn much about the other fellow as a person.

It would be extremely interesting to repeat the experiment with a group of exclusively c.w. amateurs to learn how the impression of one's fist (!)

compares with the impression of one's voice as ersonal regards the accuracy of the resulting personality mateur ratings. It might also thus be possible to answer e traits the old question of whether or not real personality mateur differences exist between those who stick to c.w. etnessand those who are primarily interested in 'phone entionoperation. The difficulty of obtaining sufficient t is not cooperation in this little study makes the writer t amafeel somewhat loath to attempt to repeat it with he air c.w. operators. Or are c.w. operators as a group themperhaps more cooperative? ir self-

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* BOOK REVIEWS

The Pageant of Electricity, by Alfred P. Morgan, D. Appleton-Century Co., Inc., New York. 363 pages, 85 illustrations. Price, \$3.50.

One assumes that this is the same A. P. Morgan who was responsible for writing Wireless Telegraph Construction for Amateurs in 1910, although his publishers make no mention of the fact. If this is true, he is not likely to repeat his three-decades-earlier success. Wireless Telegraph Construction became the standard handbook for amateurs of its time, but The Pageant of Electricity has little prospect of becoming the standard reference work in its field — the history of electricity. This was probably not the intention, anyway. If the author's sole purpose was to write an entertaining and informative narrative of electricity for popular consumption, then he has done a satisfactory job. Such an objective more or less justifies the superficial character of the subject matter, the use of legendary figures and interpretations already established in public fancy. There is little in the way of new and original research in the volume; it is chiefly a compilation of material already presented in a variety of standard sources. One attempt at departure from tradition concerns the origin of broadcasting. This attempt is something less than constructive. Morgan cites Lester Spangenberg's amateur station 2ZM as antecedent to KDKA, loudest claimant to the honor of having been the first broadcaster. While there is no doubt that 2ZM was one of the first amateurs to transmit voice and music by radio, and thereby one of the first stations in the world to do so, it seems to us there must be an essential distinction between the commercial and the amateur in referring to broadcasting. From that standpoint WWJ and W8XK (KDKA) share the honor - WWJ being first on the air, and KDKA first to attract a substantial b.c.l. audience.

Except possibly for the brief sections devoted to radio many of the phrases of which will ring familiarly - the amateur can extract measurable enjoyment from this layman's-eye view of the electrical tradition. Legendary, fictional, factual or whatnot, it is pleasant reading.

Look and Listen, by M. B. Sleeper, The Norman W. Henley Publishing Co., 2 West 45th St., New York. 96 pages, 71 illustrations. Price, \$1.00.

Television and Short-Wave Handbook, by F. J. Camm, Fortuny's, 67 West 44th St., New York. 270 pages, 130 illustrations. Price, \$2.50.

Television Cyclopedia, by M. N. Beitman, Supreme Publications, Chicago.

This television triumvirate tends to create in this reviewer a mood of philosophic rather than of technical discussion. The stuff these books contain is so very similar to that we

saw published fifteen or twenty years ago about radio. Look and Listen is a set-builder's construction kit, and is actually an assembly manual for a commercial kit now on the market, with a background in the way of fundamentals and misellaneous television information. Television and Short-Wave Handbook (written and printed in England), while a comprehensive and moderately intensive exposition of principles suitable for the earnest amateur or engineering student, is also directed primarily at the set-builder and home constructor. Television Cyclopedia gives definitions of television terminology in glossary fashion; it is intended as an introduction to television for amateurs, servicemen and set-builders.

All of which implies a belief on the part of the sponsors that there is to be another era of home set-building — that the phenomenon of the "kit" and the "hookup" that dominated 1924-1929 is to be reincarnated. If that is true, then the basis of a literature for such an era can here be found. Add to it the material on television fundamentals and construction in QST and contemporary magazines, and you'll have a practical working knowledge of the subject. Maybe, after all, here is one of the missing keys to future success that the art of television seems still to be vainly seeking.

Radio Interference Suppression, by Gordon Wm. Ingram, Electrical Review, Ltd., Dorset House, Stamford St., London, S. E. 1. 162 pages, 60 illustrations. Price 5/- net (by post, 5/3d, or about \$1.25).

An informative review of electrical interference and its suppression in a wide variety of industrial and domestic applications. Valuable chiefly to the engineer seeking a broad picture of the field, but useful also to the serviceman and amateur.

Radio Service Trade Kinks, by Lewis B. Simon, McGraw-Hill Book Co., New York. 269 pages. Price, \$3.00.

The author, manager of a chain of radio stores in New York, has been active in radio servicing since 1921. In this book he has listed alphabetically the hundreds of makes and models of broadcast receivers he has serviced, citing their customary ailments and mentioning the cures. As a guess, more than five hundred types are thus treated. These are adequately indexed for ready reference.

In style and format - spiral binding, coated paper, 9 x 11 page size -- the volume suggests the salon rather than the shop, but for any serviceman with \$3.00 cash this should be no serious disadvantage. He would stand a very good chance of getting the \$3.00 back in time saved later on.

- C. B. D.

Aeronautic Radio, by Myron F. Eddy; 502 pages, 199 illustrations. Published by The Ronald Press Company, New York City. Price, \$4.50.

The amateur thumbing through this volume will find an unexpectedly home-like atmosphere about it - maybe this aeronautical radio isn't such a fearsome subject after all! Closer inspection discloses the reason: 34 of the 178 drawings are from two A.R.R.L. publications, the License Manual and the 1938 Handbook, all but a few of them without benefit of intermediary draftsman. Here and there are a few individual touches; some of our "A's" and "B's" and "C's" have been cut off, and now and then the sections of multipart drawings have been arranged in different fashion, but the parenthood is indelibly stamped on the children. With them, of course, is much of our accompanying text; edited, often, but recognizable. Our 1938 list of preferred tube types is there intact; a few selected items from our tube tables also have been included, but we don't know where the reader will look to find the socket connections, since the corresponding diagrams from the '38 Handbook were not reprinted, nor is there any appropriate footnote to explain just what those "T's" and "I's" and "J's" mean.

Our contribution to the book is, of course, on fundamen-

tals. If the author's good taste in selecting his sources extends to the aeronautical sections (we presume it does, judging by the list of acknowledgments in the Preface where, incidentally, no mention is made of A.R.R.L. publications) the text is no doubt a reliable collection of information useful to those interested in airways operating. The larger portion of the book is devoted to commercial equipment for both ground stations and planes, radio beacons, and other radio appurtenances to aviation. There are also chapters on installation and maintenance of equipment on airplanes, traffic control, and related subjects. A useful appendix is a set of definitions of over 250 terms commonly encountered in the technical literature.

The diagrams of commercial equipment are, of course, those furnished by the manufacturers. In the others, we noticed only one obvious error, the omission of blocking condensers between the driver and Class-C amplifier in a typical circuit given in Fig. 76 (not from the Handbook!), resulting in the driver's plate voltage being applied to the amplifier grids. — G. G.

Regenerative Preselector

(Continued from page 31)

signal could be heard very plainly and the db meter read 34. The above figures would indicate that the signal-to-noise ratio was markedly increased with the preselector ahead of the receiver and that the signal strength under those conditions was approximately the difference between the db meter reading with the noise and the reading with noise plus signal, which would be 9 db. To determine whether or not this marked increase in signal-to-noise ratio was approximately the same at other frequencies, the same procedure was repeated at 14 Mc.

Results at 14 Mc.

Signal without preselector: -5 db. Signal with preselector: +35 db.

(Universal motor started.)

Noise without preselector: +18 db. Noise with preselector: +24 db.

Noise plus signal without preselector: +18 db.

(No signal could be heard from the speaker.)

Noise plus signal with preselector: +35 db. (The signal could be heard plainly along with the noise.)

It would appear from the above figures that the signal, under noise conditions and with the preselector, was again about 9 db.

Results at 1.7 Mc.

Signal without preselector: -7 db.

Signal with preselector: +34 db. (There was quite a material increase in set noise.)

(Universal motor started.)

Noise without preselector: +22 db.

Noise with preselector: +28 db.

Noise and signal without preselector: +22 db. (The signal could not be heard above the noise.)

Signal and noise with preselector: +32 db. (Signal could be heard, but not as well as at the higher frequencies.)

The above data would indicate that the signal was greater than the noise by about 4 db.

Thus, it would appear from the experimental investigation carried out that the regenerative preselector had a very beneficial effect on signal-to-noise ratio, especially on the higher frequencies.

Ham Shacks

(Continued from page 33)

he dares to call CQ. This time it's none other than our old friend VS6AO in Hongkong. A. Harbottle is the operator who, not satisfied with his daily chore of nursing several marine, broadcasting and commercial outfits, finishes the day with an evening of "Sure QSL" on 14- or 28-Mc. c.w.

The transmitter enclosure houses a rig consisting of a 42 crystal oscillator, 6L6G doubler and a pair of T20's in parallel. The receiver is an NC100 preceded by an RME DB20 preselector for which there is plenty of need in avoiding QRM from his near-by commercial charges. The antenna is a single-wire voltage-fed 14-Mc. Hertz.

VS6AO spent 16 years in the British marine service, starting back in the days of fixed spark gaps and magnetic detectors.

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We're all hoping it won't be long before we again hear the call that starts 1000 W keys rattling in unison.

Splatter

(Continued from page 10)

bands. This is just a thought and if enough interest is shown in this type of work we'll blow a page or two in QST each month to this activity. This might well go on until the lid is off once more. Start 'em coming, gang!

Lyle Peer, W2ACB, comes forth with a potent suggestion. He advocates that we publish some short technical kink that has been tried out and proved to solve the particular problem. So we are starting out this month with our first item "Experience Speaks," and we expect to publish one of these technical squibs in a box under that heading each month.

CHRISTMAS

Greetings

TO ALL HAMS

from the Crew at Headquarters

3rd Annual A.R.R.L. QSO Party

January 6th-7th (Sat.-Sun.) — For Member-Fun and Fraternalism — Tie Holder with Call Insignia To Be Awarded in Each Section — Start a QSO List, Call "ARRL de . . ." — Use Any Bands, 'Phone or Telegraph — Try Your Luck in the Party

League Members only are eligible. It is a family party for all of us members, a chance to meet our fraternity brothers. CQ's are out! The way to get contacts in this will be to send "ARRL de . . ." In the course of a contact members will tell each other two things, the name of their Section 1 and the date their membership expires, month and year.

Members in each Section are invited to chat with as many other A.R.R.L. members (anywhere) as they can. The leading member in each Section will receive his own call on the diamond

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Log forms (not necessary) will be sent free on request to Hq., or rule your own, just three columns listing calls, Sections, dates. In radio-telephone contacts the Section, membership month and year will be named. No special order is required. It's a "one operator" activity, or separate scores for each operator may be sent in.

Radiotelegraph members will abbreviate Section names and use four numerals to show membership dates. "Conn 0343" will mean "Connecticut Section, my membership good through March 1943" for example. Information to be exchanged in every case comes right off your own League membership certificate or pocket card. Members will not enter in either a radiotelegraph or radiotelephone classification. Many use both. Scores can be all by one mode, or part telegraph and part voice — and any combination of frequencies you like. When completing contacts, be sure to add to fraternalism by giving your personal "sine" (c.w.)² or nickname ('phone) before



your identifying call in conclusion of QSO's. Advance entry is unnecessary. Just take part and send in the list of members you worked with claimed score. Tell us in reporting, what frequency bands you worked, please, for information.

Starting Time: Saturday, January 6th, 2300 11 P.M. Greenwich; 3 P.M. PST; 4 P.M. MST; 5 P.M. CST; 6 P.M. EST or the equivalent at any point.

Ending Time: Monday, January 8th, 0801 8:01 A.M. Greenwich; 12:01 A.M. PST; 1:01 A.M. MST; 2:01 A.M. CST; 3:01 A.M. EST or equivalent.

Operate any 20 hours of the 33-hour party. State contest hours you did not operate if your score is over 10,000.

Scoring: 1 point for each complete set of information sent; 1 point for each set of data received and logged. No member can be worked to get more than one complete exchange for 2 points. The sum of points will be multiplied by the num-

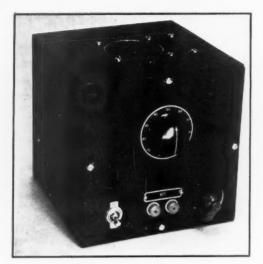
(Continued on page 90)

Don't Miss It!

Most easy to take part. Enjoyable! SWAP name of Section and monthand-year of membership expiration. Send us worked list.

¹ See complete list of A.R.R.L. field organization Sections, in the front of this issue of QST. An award is also available to the leading member in each continent (outside field organization territory). All members outside the field organization use the name of their continent instead of a section abbreviation. Note that CO-CM, K4-6-7, KA and VO as well as W members are in the field organization and cannot be also counted under a continental status. Hq staff stations and W1AW will participate but are not eligible for awards.

² The personal "sine" or sign consists of the initials of the operator, the first and last letters of his name, an abbreviation for his name, or other identifying designation. For example our "sine" is "FH," while our nickname (some prefer "handle") is "Ed." It's fraternal in amateur work and the mark of a real and experienced operator as well to have a personal sine and use it. In commercial work, the operators in a given service are often assigned personal identification to use in putting handling data on messages without confusion between two operators of the same name. In amateur work the "sine" has this use but is mainly used for fraternal, as well as convenient personal identification. The operator-sign is not required in our Party but is highly recommended for use at least on sign-off.



Useful for Individual or Group Code Instruction or as a Keying Monitor

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Front view of the code-practice oscillator and c.w., monitor all assembled. Notice the speaker grille on the top. The top of the box serves for a baffle.

A Code-Practice Oscillator and C.W. Monitor

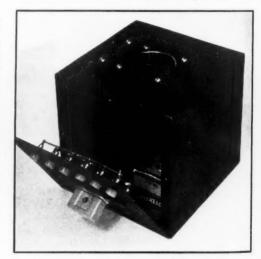
BY VERNON CHAMBERS,* WIJEQ

A SURVEY of Technical Information Service letters definitely indicates that beginners still turn to audio-oscillators as a means of generating code-practice signals. Usually they spend a few dollars for components and then find little use for the parts after the code has been mastered, the license obtained and the station assembled. As we experienced this same situation ourselves, we set out to do something about it.

Naturally, the first consideration was cost. Catalogs showed that one of the "old-reliable" oscillators (that's not its official name) could be built for approximately four dollars, including tubes and batteries, but that such a budget allowed only a bread-board affair with headphone output. Further study of the catalogs showed that we could dress up the gadget, make provision for either six sets of headphones or a load speaker in the output circuit and also make arrangements for using it as a transmitter keying monitor—all for approximately eight dollars, only twice the cost of the crude oscillator.

Fig. 1 shows the circuit. The audio oscillator is the ordinary feedback type which has been described in past issues of the Handbook. The additions needed to permit the several types of operation are not many. The selector switch, SW_2 , is connected for monitoring when thrown to position No. 1. This brings the speaker into the circuit and

connects the oscillator to the leads which run to the transmitter (a few more words about that later). In position No. 2, SW_2 places the "B" battery, the key and the speaker in series for code-practice work. The third set of switch contacts is left open to help prevent accidental shorting of the speaker and headphone circuits. A short between these two circuits might be disas-



The rear view showing the terminal assembly.

* Technical Information Service.

trous in the event of a voltage breakdown when the unit was wired into the transmitter. The battery, key and headphones are in series with the switch turned to the fourth set of

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Fig. 2 shows the transmitter center-tap circuit as modified for operating the monitor. The resistor R_1 should be chosen to give a voltage drop of 12 to 15 volts for the monitor plate circuit. Ohm's Law is used to calculate the resistance value. For instance, to obtain a 15-volt drop in a transmitter center-tap circuit carrying a combined plate and grid current of 100 ma., the resistance must be

$$R = \frac{E}{I}$$

or $\frac{15 \text{ volts}}{0.1 \text{ amp.}}$, which equals 150 ohms.

The resistor-drop method of obtaining plate voltage for the oscillator may

be employed with any type of final amplifier, but it must be remembered that the voltage drop adds

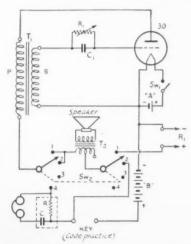


Fig. 1 — Circuit of the oscillator monitor.

 $C_1 = 0.01$ - μ fd., 400-volt tubular paper.

 $R_1 = 500,000$ -ohm variable.

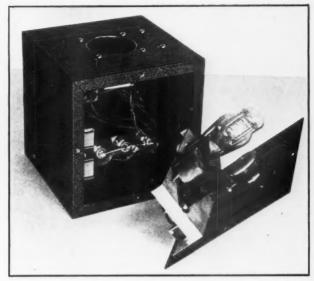
T₁ — Coupling transformer, 3:1 ratio (Thordarson T13A34).

T₂ — Output transformer; plate to 3-6 ohm V.C. (Thordarson T14S83).

Sw₁ — S.p.s.t. toggle switch.

Sw2 — 2-circuit, 6 contacts per circuit (Yaxley 3226J) (2 sets contacts unused).

Additional parts used are as follows: Speaker (Oxford type 2-ZMP); cabinet, 6- by 6- by 6- inch (Bud CU1098); chassis (Bud CB-522); One Type 30 tube; two or three 1.5-volt flashlight cells (paralleled); one 22.5-volt "B" battery (Eveready No. 763 or Burgess No. 4156); two or more pairs tip jacks (Bud PJ-837); one output terminal assembly and plug (National FWJ and FWF); one small dial plate; two small knobs.



The front "open-for-inspection" view.

to the amplifier grid bias and subtracts from the plate voltage. However, this has little effect on the amplifier operation and need not be taken into consideration if the drop is limited to 15 volts or so.

As a safety precaution, the dropping resistor, R_1 , should have two or three times the necessary wattage rating. If the resistor were to burn out, a rather high voltage would appear across its terminals and damage to the oscillator unit

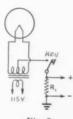


Fig. 2

probably would result. The required rating can be calculated after the correct resistance has been determined, simply by squaring the transmitter plate current and multipling by the resistance $(l^2 \times R)$. For instance, the resistor in the example above would have to dissipate 1.5 watts, the product of 0.1 amp. by 0.1 amp. by 150 ohms. Thus, to assure a safety

factor a 5- or 10-watt resistor should be used. The photographs show the unit in finished form and also "open-for-inspection." The variable pitch control is mounted toward the top of the front panel with the code oscillator key terminals below. The filament switch is to the left and the selector switch to the right. On the top is a 2-inch hole behind which the speaker is mounted. A disc of copper screen is placed between the speaker and the mounting surface. The two screws which hold the output transformer in place are at the right.

The photograph above shows the tube and audio transformer mounted on the chassis, the

(Continued on page 88)

* I.A.R.U. NEWS

Devoted to the interests and activities of the

INTERNATIONAL AMATEUR RADIO UNION

Headquarters Society: The American Radio Relay League, West Hartford, Conn.

MEMBER SOCIETIES

American Radio Relay League Asociatia Amatorilor Romani de Unde Scurte Associazione Radiotecnica Italiana Canadian Section A.R.R.L. Ceskoslovensti Amatéri Vysilaci Deutscher Amateur Sende-und-Empfangs 日本アマチュア無線聯盟 Japan Liga Colombiana de Radio Aficionados Liga Mexicana de Radio Experimentadores Magyar Rövidhullámu Amatórök Országos

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Nederlandsch-Indische Vereeniging Voor
Internationaal Radioamateurisme Dienst Eesti Raadio Amatooride Uhing Experimental Radio Society of Egypt Experimenterende Danske Radioamatorer Federation des Emetteurs Belges Newfoundland Amateur Radio Association New Zealand Association of Radio Trans-

mitters Norsk Radio Relæ Liga Irish Radio Transmitters Society

Polski Zwiasek Krotkofalowcow Radio Club de Cuba Radio Club Venezolano Radio Society of Great Britain Rede dos Emissores Portugueses Reseau des Emetteurs Français Reseau Luxembourgeois des Ama-teurs d'Ondes Courtes South African Radio Relay League Suomen Radioamatöorillitto r.y. Sveriges Sandareamatorer Unión de Radioemisores Españoles Union Schweiz Kurzwellen Amateore Union Schweiz Kurzwellen Amateure Wireless Institute of Australia

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INVESTORY

WE CANNOT find much encouragement in the results of a survey of international amateur activity. But since facts are facts and cannot be ignored, let's take a look at some statistics and see where we are:

As of the middle of this year, there were 32 active societies affiliated with the Union. Of the countries thus represented, only 8 permit amateur radio operation at present. They are: United States, Estonia, Japan, Colombia, Hungary, Mexico, Netherlands East Indies and Venezuela. Perhaps it should be noted that in the "shutdown" column are listed Italy, who does not legally permit amateur operation anyway; Spain, shut down for the period of civil strife but now expecting to resume amateur operation shortly: and Cuba, temporarily closed pending formation of new amateur regulations. The mortality rate among the societies themselves has not been so high; we know of only three which have been forced to cease operation completely - P.Z.K., R.E.F. and U.S.K.A. There may be others.

Disregarding Union membership for the moment, a check of 85 large (with respect to normal amateur radio activity) countries and colonies shows that 53 are off the air and only 32 are on. In point of number of amateurs, we find that 15,000 of the world's approximately 20,000 (exclusive of U.S.A. and possessions) amateurs are silent, or a percentage of 75 off the air.

U.R.E. REORGANIZATION

The Unión de Radioemisores Españoles reports itself making good progress, with the election of a general board as follows: Angel Uriarte (EA4AD), president; Jose Gutierrez Corcuera (EA4AT), vice-president; Manuel Rodriguez Cano (EA4BE), treasurer; Francisco

Bellon (EA4AQ), auditor; and Jesus M. Cordova (EA4AO), secretary. The address is as before: Box 262, Madrid.

The society hopes to obtain very soon the necessary permit for normal operation and government licensing. Plans are also being made to take up with the telecommunication authorities the actions of the Cairo conference with respect to their effect on amateur radio, particularly with reference to 7-Mc. broadcasting. It is the wish of the society to resume publication of the official organ as soon as possible, although it is realized that to do so successfully necessitates a partial completion of the business cycle in radio parts sales so there will be advertising revenue avail-

SOUTH AMERICA

Although to our knowledge no South American country has closed down its amateurs, several have issued government orders concerning neutrality which affect the extent of amateur operation. Argentina, for example, on September 20th prescribed the following restrictions on amateur activity: Communication, actual or attempted, with stations in belligerent countries is prohibited; in domestic communication and that with any Spanish-speaking country, only that language may be used; all communication containing comment, news or even simple reference to the political or economic situation of any country is prohibited; amateurs should operate only during the period of the working day and on preselected frequencies — the government is sending a questionnaire to each licensee requesting him to pick a frequency and regular hours for his future operation; strict fulfillment of regulations regarding third-party traffic is ordered. The government has selected a number of stations to act as deputy monitors of amateur activity.

Chile issued an order on November 1st concerning neutrality in communications, and although we do not have details it is believed similar provisions were included for amateurs.

A number of radio amateurs in Colombia have affiliated themselves with the newly-formed government radio reserve, the "Army Radio Net," similar to the Army Amateur Radio System in the United States. "Thus," says the government announcement, "our amateurs are preparing to serve the interests of our country in an efficient manner."

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European conditions have forced the close-down of amateur radio in still another neutral country — Sweden. However, "... the interest for ham radio is still left," says SM5KP, "and the majority of active amateurs are now rebuilding and improving their equipment in order to make a good come-back when we are allowed to go on the air again one day."

OSL BUREAUS

The following changes should be noted: France — Bureau suspended.

Spain — U.R.E., Box 262, Madrid. Sweden — Bureau suspended.

U.S.A., Fifth District — James F. Manship, W5ALE, 910 So. Boston, Tulsa, Oklahoma.

CUBA BACK ON THE AIR

BEGINNING about the 1st of December, and continuing over a period of several days, Cuban amateurs, in groups, were given authority to return to the air; all of them should be on by the time this material appears. It is not known at the moment what important changes, if any, were made in the law governing amateurs, but we shall report any such news of interest next issue.

On a commission designed by the Secretary of Communications to confer with him on the formation of the new law were Sres. Justo Mahia y Rivas, CO2JM, head of the short-wave section of the Radio Club de Cuba, Guillermo Madrid, CO2WM, and Rafael Bordenave, CO2RW.

ICELAND

In the midst of these dark days for European amateur radio, there comes a note from our friends in Iceland telling of their battle to secure government licensing of amateur activity in that country. Undaunted by continued opposition, they are persistent in their efforts to win recognition of the authorities and an eventual official fostering of amateur activity.

HERE AND THERE

AUSTRALIAN amateurs who own b.c.l. sets will have to secure regular listeners' licenses for their operation as soon as the expiration date shown on their amateur licenses has been reached.



J. A. Gilmand, operating ON4SG portable on 80meter c.w. in Kessel, Belgium, sometime before September 1st.

Before suspension of amateur radio, possession of a station license exempted the holder from having to obtain a second permit for his broadcast receiver. . . . Although the exact date is not known, amateurs in Roumania were closed down in the early weeks of the war. . . . We notice in foreign magazines, both commercial publications and amateur organs, a number of articles on "learning the code." . . . Word comes that all amateur stations in Austria and Germany are closed and all transmitting apparatus has been confiscated by the post office department, but that the hams are very busy improving their code ability and building receiving and auxiliary equipment. . . . It is customary for this department to carry in the January issue a complete list of countries as compiled by the A.R.R.L. for its DX Century Club. Since no major change has been made in the list as published a year ago, it will not now be repeated. . . . The Wireless Institute of Australia, upon taking the matter up with their P.M.G. Department, were advised that "call signs at present held by experimenters will be reserved for them when licenses are again issued.'

Switch to Safety!

(Continued from page 41)

6 ma., the average 7.8 ma. Using pliers held in each hand as electrodes, the maximum voltage that any subject could take and still release was 40 volts a.c., the average 27.8. That means that if you get a really good grip on a fresh 90-volt Bbattery you probably won't be able to release it. In fact, in some tests where 22 subjects completed a circuit by trying to pick up an object immersed in a bucket of water, it was found that the maximum voltage the individual could withstand was between 12 and 20, and the doctor in charge of the tests concluded that, regardless of the general health of the men, anything over 12 volts was extremely dangerous under wet conditions! So how much chance have we got of ever getting away from 1500 or so?

Switch to safety!



HINTS AND KINKS



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ANOTHER HARMONIC OSCILLATOR CIRCUIT

In deciding on a crystal oscillator circuit there are many points to consider:

 Should a triode, a tetrode, or a pentode tube be used?

2. Will the frequency be stable?

3. Will the crystal operate at low r.f. current?

4. Will the plate reaction on the grid circuit be minimized?

5. Will the circuit be suitable for the production of harmonics?

6. Will few component parts be used?

7. Will the circuit permit using crystals ground for all bands from 10 to 160 meters?

It is difficult to satisfy completely all of these conditions, but the circuit of Fig. 1 does approach this ideal.

The oscillator tube shown may be either a tetrode, or a pentode with suppressor connected internally or externally to cathode. This choice was made because electron coupling could be employed, immediately providing the answers to considerations I and 4, since the output circuit has little effect on the crystal grid circuit with screen and plate coupled in this fashion. The crystal, screen, cathode, 0.0005- μ fd. condenser, and the 100- μ μ fd. condenser form the oscillator proper. With no tuning coil placed in the oscillator portion of the circuit band changing is simplified and fewer parts are used.

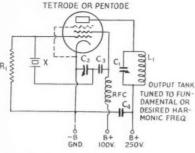


Fig. 1 — Harmonic crystal oscillator with one tuned circuit.

 C_1 , $C_2 - 100$ - $\mu\mu$ fd., variable. $C_3 - 0.0005$ - μ fd., 600-volt mica.

 $C_4 - 0.002$ - μ fd., 600-volt mica. R₁ - 40,000-ohm, 2-watt carbon.

L1 - Output tank coil, determined by frequency band.*

* Suitable coils are listed in Chart, Fig. 516, 1940

If the operation of the oscillator is confined to use with 160- and 80-meter crystals, a 50- to 75- $\mu\mu$ fd. fixed condenser may be substituted in the circuit for the 100- $\mu\mu$ fd. variable condenser shown, reducing the cost of the oscillator and simplifying adjustment.

Excellent harmonic output may be obtained with this arrangement, the second harmonic nearly equals the fundamental output, and fourth-

harmonic power is appreciable.

The oscillator operates in the following manner: The screen grid acts as a plate (similar to Tri-tet operation), the 0.0005- μ fd. condenser blocks the direct current and provides one part of a capacity voltage divider for the r.f. voltage developed in the screen circuit. The 100- μ μ fd. variable condenser acts as a by-pass to the screen circuit and the crystal grid circuit, a common impedance to these two circuits but not to the plate circuit, providing the feed-back from screen to grid necessary for oscillation. Experiments have shown that the plate-circuit isolation is excellent. Interaction from tuning and loading is reduced to a minimum. Frequency change with tuning of the plate-circuit is negligible.

The size of the grid-leak resistor may be determined experimentally for best fundamental or best harmonic output, depending on the major use of the oscillator. The 40,000-ohm resistor shown should be satisfactory for harmonic operation. Voltages as low as 160 volts plate and 75 volts screen, and as high as 480 volts plate and 250 volts screen have been used with entirely satisfactory results. The simplicity of construction and adjustment make this oscillator a very worth-while unit for the amateur station.

- Donald A. Bush, W8ONW 214 Third St., Aspinwall, Pa.

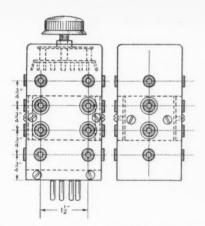
ANOTHER COMPACT MULTIPLE CRYSTAL MOUNTING

description of the multiple crystal-mounting unit shown in the sketch of Fig. 2. The foundation is a National PB-10 coil shield which will accommodate 12 1%-inch crystal holders in an extremely small space. The unit may be plugged into the usual 5-prong socket used for single crystals.

Pin-type jacks are used for the contacts. There is sufficient space for four pairs on each of the broad sides of the shield can and the narrow sides

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Fig. 2 — Compact multiple crystal holder made from coil-shield plug-in unit. The arrangement accommodates 12 crystals.

will accommodate two pairs each. Of each pair, one contact may be grounded to the can, while the other must be insulated. An insulated-type jack may be used, or clearance holes may be drilled as shown in the sketch and the holes backed up with pieces of polystryene sheet in which the jacks are mounted. Incidentally, the new ultra-compact ceramic crystal socket made by Millen should be just the ticket for this job. The standard spacing of ¾-inch is used between the jacks of each pair and the double rows on each of the broad sides are spaced 1½ inches.

The Yaxley type 1311L 11-point, single-circuit switch which is used just fits inside the top of the can so that care should be exercised in mounting it with the shaft in the exact center of the top.

The easiest way to wire up the unit is to solder leads of about the right length to the switch terminals before mounting the switch and then mount the jacks, one at a time, starting at the top connecting each one as it is mounted. The can is grounded to one of the base pins, while the switch arm is connected to another so that correct connections to the circuit are made when the unit is plugged in.

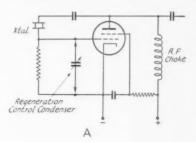
GETTING RESULTS WITH THE PIERCE CRYSTAL OSCILLATOR CIRCUIT

Many of us are attracted by the simplicity of the Pierce crystal oscillator circuits. However, there seems to be an abundance of grief connected with getting them to operate properly. Extremely active crystals such as "AT" or "Y" cuts usually perk OK, but the ordinary garden variety of "X" cut plates displays a great tendency to do just nothing. The following suggestions may be of help to those having trouble with the circuit.

Fig. 3-A will be recognized as the oscillator used in W8NCM's ultra-simple portable rig described on page 28 of August (1939) QST. With

many crystals this circuit performs perfectly. With many others of good make it absolutely refuses to produce a thing. A 50- μ pfd. variable condenser connected between the grid and the cathode as shown will allow any crystal to be used. The adjustment of this condenser is fairly critical and should be made with care so that the crystal r.f. current will not rise to a value sufficient to fracture the crystal. The smallest amount of capacity that will cause reliable operation should be used. The same idea applies to the ordinary triode version of this circuit except that perhaps a larger condenser may be needed.

Fig. 3-B is also a well-known circuit and is often recommended for harmonic operation. It is used in the 6L6 two-band transmitter in Fig. 836 in the 1939 A.R.R.L. Handbook and is the circuit used in W6OQH's emergency portable on page 29 of August, 1939, QST. More frequently than not the second harmonic is absolutely nil. This is because the Pierce triode circuit utilizing the screen grid for its "plate" must be capable of oscillating of its own accord when delivering output on the second harmonic. The regular plate circuit is merely an amplifier of the second harmonic. The crystal circuit should oscillate even if the plate coil is removed. If it does not there will be no second harmonic output in a properly operating circuit. The answer again is to place a small variable condenser between the grid and cathode of the oscillator tube. The adjustment of this condenser is rather critical and, as with the Tri-tet circuit, it should be set to give



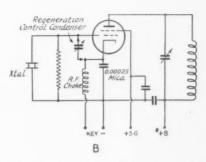


Fig. 3 — Circuits for introducing regeneration in Pierce and gridplate oscillators to help operation with stubborn crystals.

the greatest output consistent with the lowest crystal current. When operating on the fundamental frequency, this condenser should be set at zero or preferably removed from the circuit. All the rules that apply to Tri-tet operation should be observed.

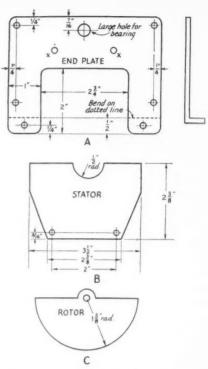
Only tubes with negligible plate-to-grid capacity should be used for fundamental operation unless provision is made to reduce greatly the amount of regeneration in the circuit.

A word about the crystals and their holders would not be out of place. The crystal holder plates should be ground to a smooth flat surface the same as the crystal itself. Warped plates are the cause of many crystal troubles. Both the crystal and the plates should be thoroughly cleaned with carbon tetrachloride and great care taken not to touch them with the fingers afterward. The pressure exerted by the crystal holder spring often causes erratic operation. Readymounted crystals are usually adjusted at the factory. When crystals are changed from one holder to another it would pay one to experiment a little with the pressure of the spring in the holder. In some cases, failure to oscillate may be caused by excessive capacity between the plates of the crystal holder. The remedy is to replace one of the plates with one of smaller size. Disks or square plates about half an inch across have proved very satisfactory with 80-meter crystals. - Ed. Preston, W8CSE

HOMEMADE HIGH-VOLTAGE TANK CONDENSER

ALTHOUGH variable condensers with close plate spacing require high mechanical precision, it is possible to build a satisfactory high-voltage transmitting condenser with no more mechanical skill than that possessed by the average amateur who is familiar with the use of tools. Of course, the inaccuracies which develop will result in a condenser slightly larger in size for a given break-down voltage, but this is usually of little consequence.

The accompanying sketch and photographs of Figs. 4, 5 and 6 show the details of a tank condenser which should withstand a peak voltage of about 5000 per section. The capacity will run



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Fig. 6-A-End plate. B-Stator plate. C-Rotor plate.

about 50 $\mu\mu$ fd. per section. The material may be purchased for about four dollars.

Referring to the sketch, the end plates A are cut from ½-inch brass, copper or aluminum. After the two pieces have been cut roughly to size, they may be clamped together with a pair of screws through holes drilled for the purpose, such as those shown in the drawing of Fig. 6 at X. They may then be finished up together with a file and the pieces will be identical. The mounting feet are bent at the dotted line after making deep scratches along the line on each side of the piece.

The condenser plates are cut from ½32-inch sheet aluminum, which in my case was obtained (Continued on page 92)

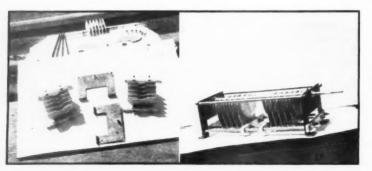


Fig. 4 (L.) — Various sections of the homemade tank condenser before assembly. The end plates and the two completed stator assemblies are in the foreground and the rotor assembly for use.

Fig. 5 (R.) — The complete tank condenser ready for use.



CORRESPONDENCE FROM MEMBERS

The Publishers of QST assume no responsibility for statements made herein by correspondents

AN O.O. OBSERVES

319 Wisconsin St., Sparta, Wis.

Editor, QST:

In keeping with my appointment as Official Observer, I fully expected to do some "observing," but I wasn't expecting to do so much. Perhaps it was reasonable to expect an abundance of bad notes and off frequency operation during the Sweepstakes when so many more amateurs take to the air, but the old F.C.C. say-so still holds — "there may be an

excuse but there is no reason."

As an Official Observer I certainly do not intend to become over-exacting. If an amateur has a bad note and is continually working to make it better, then I'm not going to hop all over him, but I expect to land rather hard on the fellows who operate day after day when they know their signals are not up to the standards set forth by the F.C.C. During the Sweepstakes I noticed that many of the violations I encountered were by newcomers to amateur radio, fellows who have had their tickets a year or less. Let it be said, however, that plenty of violations from the old-timers were heard also, and that brings up my idea as to why the newcomers seem rather lax in many cases. They listen to some of the other fellows who have been on the air several years and hear some rather flagrant violations, therefore they think that the F.C.C. regulations aren't really as binding as they are. Then when they get their transmitters going, they do not consider the regulations to any great extent. The result is just that many more violations to deal with. There is only one remedy for this situation, and that is for all amateurs, with no exceptions, to take particular care to see that their operation and equipment meets F.C.C. standards. Our government has been generous with us during these uncertain times, and in return we should show our appreciation by observing not only the neutrality regulations but all regulations, thereby giving no cause for cancellation of privileges due to misbehavior citations. A "misbehavior" can be exemplified by calling to mind the fellow who appeared on 6990 kc. with a T4 chirpy signal and made it mighty difficult to copy the Armistice Day message from WLM.

Amateur radio is strong in this country. It can be made stronger if we all realize that F.C.C. regulations are not a collection of 1000 new jokes.

- Glen C. Daniels, W9YXH

often tune all the way from 14,150 to 14,250 kc. without the needle of the meter dropping away from the pin once. (I have reference to the right hand pin.) But only three or four stations on the band can be easily read despite the fact that all of them are entitled to S9 plus plus reports — unless I should choose to say, "Well, old man, you have the needle up against the pin, but in all honesty I should say you are about S8."

On the other hand, with no change whatever in the meter adjustment as provided on the rear of the chassis, I can sometimes read perfectly a signal so weak as to fail to push the needle up to S1. This generally occurs on the 75-meter band during quiet forenoon hours on the weaker signals. And here, I believe, a report of S1 is just as misleading as a

report of S9 plus in the first instance.

Does the solution lie in establishing a standard based on microvolts at the receiver? I don't think so. It may be a matter of academic satisfaction to know that you are putting umpty-ump microvolts into the other fellow's shack, but that is small satisfaction if he comes back nevertheless with "QRM".

What we seek is some standard of comparison that will be independent of both man-made and God-made variables, that will provide a common denominator for receivers, both single-signal supers and t.r.f.'s, for antennas, locations, and varying conditions prevailing in the ham bands.

My proposal is that we select as this standard the loudest signal or signals on the band at the time of operation, and call this signal strength S5. (One to 9 embraces too many

divisions.)

Instead of adjusting the potentiometer which sets the meter from the rear of the chassis, let's have it out on the front panel, preferably right under the meter. Each time you sit down to operate your rig—or shift to a new band—spin the bandspread, note the tops in signal strength, and set the meter to read \$5 on that signal. In other words, when conditions change, \$5 changes.

The discrepancies that may creep in, using this system, are far preferable to the virtual meaninglessness that now prevails. An S5 report would mean, "Your signal is as loud as any on the band," and 5 plus would mean that no other signal was so strong. S4 would mean very strong; S3 would mean average; S2 would mean weak, and S1 would mean as weak a signal as could be picked up.

How about some discussion?

- Jonathan Eddy, W1LAU

USE OF THE S-SCALE

Pleasant Valley, Conn.

Editor, QST:

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That our system for reporting signal strength remains unsatisfactory is generally recognized. I wish here to propose simple means that might enable "R" or "S" reports to accomplish what was originally intended, namely to convey an accurate description of station performance during a given contact.

The present deficiencies arise mainly from two sources: dissimilarity of receiving equipment, and lack of a common denominator for what we refer to as "conditions". Under the dissimilarity of equipment may be lumped not only the hodge-podge of "R" and "S" meters, but other structural and electrical differences, difference in location, in antenna systems, in noise levels.

To take a convenient example, my receiver is one of the stingiest on S points. Yet it is a fact that, with a preselector and one of these down-on-the-farm high-gain antennas, I can

AND LEAP YEAR COMING ON:

Editor, QST:

Bowbells, N. Dak.

The letter from W7FWB which you published in July QST has brought remarkable results, and the YL Radio League is advancing by leaps and bounds.

Although we have already contacted over one hundred YL ops, I feel sure that this letter, if published, will reach many more who do not yet know about the club.

All YL's and XYL's who have their own tickets are eligible for membership, and may have more information about the club by writing to me. We may be few in number in comparison with the number of OM's, but by working together we can show that we hold a definite place in amateur radio.

— Enid Carter, W9NBX, Secretary, Y.L.R.L. (Continued on page 96)

January 1940

OPERATING NEWS

F. E. HANDY, WIBDI, Communications Mgr.

E. L. BATTEY, WIUE, Asst. Communications Mgr.

The A.R.R.L. Member Party comes but once a year. On the ultra-highs or the low-low frequencies alike, it's a chance for members to get acquainted. As at least one fellow said in speaking of the "SS," the joy of it is like a convention. That is especially true of the A.R.R.L. Party. You meet a bunch of old friends and make some new. Fellowship is emphasized in the QSO's even as a hearty handclasp is the outward symbol of our convention and hamfest adventures. All members are urged to take part. See announcement this issue. For those who like to keep track, a simple scoring plan is included. But you don't have to pay any attention to "points" . . . enjoy the contacts . . . test your rig . . . meet the gang . . . and report, whether you spend ten minutes or hours at the controls. The dates? January 6th and 7th.

The Century Club rules are re-run in this issue, brought up to date by inclusion of the rule against submission of altered cards, with the penalty therefor. In order that Century Club policies may not be in conflict with our war neutrality responsibilities and recommendations (p. 66, Nov. 1939 QST) that we do not work belligerent nations' amateurs under any circumstances, a new rule, now effective is that confirmations of contacts with any such countries will not count. The list of such countries is that determined by Presidential proclamation. Of course for the most part all warring nations already have terminated or suspended amateur licenses, effective with the date of declaring war, so the effect is only to eliminate any improper encouragement of work with the few political-military pseudo-amateur or definitely bootleg stations.

U.H.F. DX? 1940, with interest in the ultra-highs growing by leaps and bounds will see a lot of records shattered, DX and otherwise. Did you notice that all hams are asked to report their new states, for an award to see who can roll up the most states during the year? The record of u.h.f. STATES will amount to the same thing for the u.h.f. gang that the CENTURY CLUB means to the low-frequency men who are after countries!

A beautiful CUP Trophy may move to parts unknown this coming year. We're giving it the best of care. Known as the M.R.A.C.-A.R.R.L. 56-Mc. Achievement Award, it was announced in July 1937 QST. For the information of possible winners we summarize the award conditions:

For the first licensed U. S. amateur work, two-way between continents..., the great circle distance covered in excess of 2000 miles..., the transmitters utilizing 56-60 Mec, this award will be made. Written evidence from all principals must show what information was exchanged, and prove to the satisfaction of the officers of the Miwaukee Radio Amateurs' Club and the American Radio Relay League that two-way communication was effected.

The U.H.F. Marathon for 1940 gives everybody a chance at development of the important u.h.f. bands — 56-112-224-and-up Mc.! Analysis of member-equipment shows a surprising amount of u.h.f. equipment put to work as a sideline in low-frequency stations. This contest should be an invitation to get the habit of a night or two a week working the ultra-highs, or perhaps we should suggest week-ends as the profitable time for all concerned to try out for new contacts. At any rate, don't leave your u.h.f. stuff in the attic, for next summer to roll around. Get in on this

part of amateur radio, too, and send in your points each month. Work with some other local hams to better your set up. Use a few postal cards or low-frequency messages for experimental skeds and try to extend your range. Each Emergency Coördinator may need a local u.h.f. net to connect important local points with communication in emergency, if and when hurricane, flood, 'quake, or other disaster requires. These frequencies are well fitted for reliable work when we learn how to make full use of them. Our public service planning makes it desirable that all u.h.f. equipment, emergency powered or otherwise, be registered in the League's Emergency Corps. Do all you can on u.h.f. and report points for the Marathon each month.

The A.R.R.L. Emergency Corps Needs You. Re-registration is now the order of the day for all amateurs throughout the entire League Emergency Corps. We start every year right by having a complete overhaul of the personnel of the A.E.C. The League field organization of today is founded on the principle of qualification for posts, of service to brother amateurs or the public (in each appointment), on a showing of consistent activity or re-registration to show continued availability and readiness for service. That part of League organization which is dedicated to emergency work receives suitable blanks each year-end for return to the League Headquarters to make a complete reconstruction of personnel records possible. Men who have changed equipment so show; those who have moved indicate new address; those whose work has required giving up amateur activity, or who for other reasons do not reply, are dropped from the rosters until again heard from. Only new members of the Corps receive the A.E.C. Emergency-Identification Cards, since the original cards are continuing in effect, if blanks are returned.

During December and January each A.R.R.L. Emergency Coördinator has been asked to plan local ways and means and take steps to enlist new A.E.C. Members. All amateurs are behind the Emergency Corps in spirit. In practice the League aim is to be able to show the F.C.C. and the Red Cross that all active amateurs are actually enlisted! Operators and regular stations are needed in the program as much as those with emergency power. The plan is for some sort of annual roll call or mobilization meeting to be arranged in each community for the purpose of REGISTERING EVERY AMATEUR STATION IN THE A.R.R.L. EMERGENCY CORPS and furthering the plans for use of amateur facilities in the community and public interest in the event of any communication need. Just as the Red Cross holds an annual Roll Call, this is our invitation to you to attend such a meeting (or get blanks from us direct) all to help in practical emergency preparedness, and to extend the readiness and prestige of the amateur service. This invitation isn't to League members alone, but to all amateurs, for the good of amateur radio. If you haven't, will you do your part and register, please! - F. E. H.

Unlicensed Operator Indicted

Preston Funk of Philadelphia was indicted recently by the Federal Grand Jury for operating an unlicensed radio station, masquerading as an amateur. Funk, who holds neither operator nor station license, was operating on 1.75-Mc. 'phone using the call W3IAN (which is properly assigned to an amateur in Newport News, Va.). He was tracked down by L. E. Kearney, R. I., by means of a direction finder and mobile receiver equipped with field strength meter.

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PRIZES FOR BEST ARTICLE

The article by Mr. Charles F. Rockey, W9SCH,* wins the C.D. article contest prize this month.

Each month we print the most interesting and valuable article received marked "for the C.D. contest." Contributions may be on any phase of amateur operating or communication activity (DX. 'phone, traffic, rag-chewing, clubs, fraternalism, etc.) which adds constructively to amateur organization work. Prize winners may select a 1940 bound Handbook, QST, Binder and League Emblem, six logs, eight pads radiogram blanks, DX Map and three pads or any other combination of A.R.R.L. supplies of equivalent value. Try your luck. Send your contribution to-day.

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Key Adjustment

BY CHARLES F. ROCKEY, W9SCH*

AFTER having listened to, and indulged in, all manner of code manipulation on the various amateur bands during the last five years. I have formed the opinion that many of the "punk fists" heard on the air are not the result of inability or "cussedness" on the part of the respective operators but of improperly adjusted keys.

Of late there has been much said about the proper use and adjustment of the semi-automatic or "bug" key, therefore more along this subject would obviously be superfluous. However, doubtless due to its simplicity and apparent obviousness, the subject of proper use and adjustment of the common, so-called, hand key has been almost neglected. Result: possibly thirty percent more "lids" than need be.

Fundamentally the hand key is nothing more or less than a simple lever of the second class, which your physics professor will tell you is a lever wherein the resistance or counter effort is situated between the effort point and the bearing or fulcrum and in which case the effort and counter effort oppose each other in direction. In the case of the key, the counter force is represented by the spring and the power to balance it is, of course, the operator's arm. The fact that there is a back stop, and the presence of the contacts, is incidental to the fundamental analysis. Therefore, a little thought will reveal that in the operation of brass pounding, what one really does is to periodically overbalance the spring tension, by pressure of his wrist to the extent that the end result of closing the contacts is obtained. Thus it is readily seen that in pounding the key one is not working against the contacts but against the spring. The spring, however, is not the only factor. Assuming that, as in all good keys, the trunnion bearings are quite frictionless the other factor that must be considered is the distance over which the effort must move, inasmuch as the work accomplished is not the force exerted alone or the distance alone but the product of the two. Thus the problem resolves itself into that of balancing the operator's physical characteristics with the characteristics of the key which involve the spring tension, and the distance of vertical knob travel, a case of mechanical impedance matching, as it were. It is easy, then, to see that when the key is properly adjusted the operator is working at his peak of efficiency. When the spring is too loose or when the distance of knob travel is too small the operator must work against himself and therefore he wastes energy, while it is easy to see how a too stiff spring or too wide contacts (too much vertical knob travel) will likewise tire one out. From this it may be gathered that there is a critical key adjustment for every operator, which indeed seems to be the case. In my own case it appears that the "best" adjustment seems to vary, slightly, from day to day, facetious as it may seem. There can be no hard and fast rules for key adjustment because individuals are so

unlike. However a few principles, humbly suggested, might be in order:

- Adjustments should start at minimum spacing and spring tension and be increased until things "feel right." One must be his own judge in this matter and no rules can be set. Again — let it be stressed that no one else can properly set your key for you.
- Plenty of time should be taken in these adjustments and they should be corrected from time to time. This is no "set and forget" matter if best results are to be had. "Trifles make perfection but perfection is no trifle."
- 3. DO NOT MAKE THESE ADJUSTMENTS WITH THE TRANSMITTER ON THE AIR. This should be presupposed, but bears repetition anyway. Use a buzzer or oscillator for listening tests.
- 4. Make sure that your key is in good condition to begin with. If it isn't, fix it up or throw it out and get one that is. One cannot play a sonata on a cow bell!

In conclusion, let me suggest that you try re-adjusting your key and see whether it doesn't improve your operating pleasure and skill. You will probably find as a result that where you were formerly a "QRU 73 cul" artist, you will become a staunch supporter of the "Royal Order of Bacon Rind Munchers," and the other fellows will be glad to QSO you. Try it and see.

Brass Pounders' League

(October 16th-November 15th)

				Extra De	1.
Call	Orig.	Del.	Rel.	Credit	Total
W7EBO	17	60	1662	40	1779
W6DH	98	226	648	210	1182
W5FDR	87	198	726	146	1157
W9 Q1L	65	125	885	79	1154
W3EML	96	158	673	136	1063
W4PL	15	29	929	10	983
W5MN	16	29	776	69	890
W4IR	17	67	668	29	781
W9EKQ	7	32	668	0	707
WILWH	28	58	594	14	694
W9NFL	7	25	595	20	647
W3BWT	44	62	473	54	633
W5CEZ	34	146	416	24	620
W9YXH	44	50	494	23	611
W3CIZ	40	102	348	92	582

MORE-THAN-ONE-OPERATOR STATIONS

			Extra Del.				
Call	Orig.	Del.	Rel.	Credit	Total		
W5OW	400	515	1236	371	2522		
KAIHO	271	122	618	114	1125		
W2SC	42	159	592	151	944		
W9BNT	83	139	469	31	722		
WIAW	53	251	157	242	703		

These stations "make" the B.P.L. with total of 500 or over. One hundred deliveries + Ex. Del. Credits also rate B.P.L. standing. The following one-operator stations make the B.P.L. on deliveries. Deliveries count.

tive man can our de		**
W210P, 300	W6MDI, 134	W81HR, 113
W6PCP, 206	W9UN, 134	W2LZR, 110
W6LUJ, 197	W6MFH, 131	W8QGD, 110
W6NRP, 174	W1JXP, 128	W2ITX, 107
	W1FFL, 124	W6HH, 105
	W9THS, 118	W5DLZ 102
	W6MQM, 114	

A.A.R.S. MORE-THAN-ONE-OPERATOR STATION

			Extra Del.					
Call	Orig.	Del.	Rel.	Credit	Total			
WLM (W3CXL)	166	152	3300	66	3684			

A total of 500 or more or 100 deliveries Ex. D. Cr. will put you in line for a place in the B.P.L.

^{*233} Franklin, River Forest, Oak Park, III.

W1AW Operating Schedule

OPERATING-VISITING HOURS

3:00 P.M.-3:00 A.M. E.S.T. daily, except Saturday-Sunday.

Saturday - 8:30 P.M.-2:30 A.M. E.S.T. Sunday - 7:00 P.M.-1:00 A.M. E.S.T.

OFFICIAL BROADCAST SCHEDULE (for sending addressed information to all radio amateurs).

Frequencies

C.W.: 1761-3825-7280-14,254-28,600 kcs. (simultaneously)

Starting Times (P.M.)					S	peed	8 (W	.P.	M.)	
E.S.T.	C.S.T.	M.S.T.	P.S.T.	M	T	W	Th	F	Sat	Sun
8:30	7:30	6:30	5:30	20	15	25	15	20	_	20
Midnight	11:00	10:00	9:00	15	25	15	20	15	15	-

PHONE: 1806, 3950.5, 14,237, 28,600 kcs.

Each code transmission will be followed in turn by voice transmission on each of the above frequencies.

GENERAL OPERATION:

Besides specific schedules in different bands, W1AW devotes the following periods, except Saturdays and Sundays, to GENERAL work in the following bands:

Time, E.S.T.	Frequency
4:30 р.м 5:00 р.м.	28,600 kc. Fone/CW
6:00 р.м 6:30 р.м.	14,237 kc. Fone
6:30 p.m 7:00 p.m.	14,254 kc. CW
8:00 р.м 8:30 р.м.	14,254 kc. CW
9:30 р.м10:00 р.м.	3950 kc. Fone
10:00 р.м10:30 р.м.	14,237 kc. Fone
11:30 р.м12:00 л.м.	1761/1806 kc. CW/Fone
1:00 a.m 2:00 a.m.	3825 kc. CW
2:00 a.m 3:00 a.m.	7280 kc. CW
7:00 P.M 8:00 P.M. Skeds of	on 80 meters.

10:30 P.M.-11:30 P.M. Nat'l Trunk NCS 3670 kc.

At other times, and on Saturdays and Sundays, operation is devoted to the most profitable use of bands for general contacts and to participation in special week-end operating activities. The station is not operated on legal national

Give W1AW a call for an accurate frequency measurement, to communicate with any department of A.R.R.L., to rag-chew when time permits, or to pass a message to ham friends in other places or on other bands.

BRIEFS

Add father-and-son schedules: WSTLR, East Cleveland, Ohio, father; W8OYE, Springfield, Ohio, son.

A suggestion on how to locate small towns is offered by W6LCS, O.R.S. The Official Railway Guide lists alphabetically all points which are on a railroad. Opposite each town's name is shown the railroad or railroads on which it is located and the number of the time table in which the town appears; a map is shown for each railroad - and there you are. W6LCS points out that old R.R. guides are just as useful as new ones, and it is quite often possible to secure one from your local agent.

October '39 O.R.S.-O.P.S. Parties

THE October O.R.S. and O.P.S. get-togethers provided the usual good sport, with the scores bearing out this fact: 76 operators made scores of over one million points in the O.R.S. Party! W3BES again leads this group - unless the confirmation of essential details on W9VES' reported score (over 18 million) comes through. W80FN has given the lads something to think about - placing second. In the O.P.S. group, W3FJU stepped into first place, followed by

W2HXQ. Congratulations to all the operators listed below. The next quarterly O.R.S./O.P.S. Parties are scheduled for January 20th-21st. Plan accordingly, and don't miss out on the fun! Non appointees should take steps to look into

the qualifications for appointments and get in on the many interesting activities enjoyed by the O.R.S. and O.P.S

OFFICIAL RELAY STATION SCORES (OCT.)

Station	Score	Diff. Stns.	Diff. Sects.	Heard	Power (Watts Input)	Operating Time
W3BES	17,003.808	224	48	14	200	20 h.
W80FN	15,699,204	192	52	1	800	20 h.
WITS	14,444,901	209	49	8	350	20 h.
WIJTD	11,550,000	184	47	36	150	20 h.
W9EYH	11,171,600	169	51	20	90	20 h.
W2HMJ	10,697,625	180	45		300	18 h., 25 m.
W4EV	10,070,306	151	51	18	300	18 h., 40 m
WSJTT	9,436,929	167	52	36	125	19 h., 15 m.
W3DGM	8,292,500	168	46	25	40	20 h.
W8TNC						
(W2CTT op.)	8,080,368	166	47	6	700	17 h., 15 m.

				II.			
Station	Score	Stns.	Sects.	Station	Score	Sins.	Sects.
W6RBQ	8,004,535	142	45	W5KC	3.673,655	112	43
W3GDI	7,036,016	147	45	W5AZB	3,701,308	113	45
W3GHM	6,815,340	145	44	W3HQU	3,460,860	113	40
WIEOB	5,820,870	146	40	W2LXI	3,375,112	130	36
W3GJY	5,179,920	150	41	WSSJF	3,297,460	116	42
W8RMH	5,149,606	143	44	W8GBF	3,257,600	119	41
W2JKH	5.059,456	145	43	W3FLH	3,209,250	112	38
W6CIS	5,003,880	104	43	W6BAM	3,111,768	93	39
W9TQD	4,894,680	125	43	W6PGB	2,948,804	134	40
W7CMB	4,876,110	108	45	W3HUM	2,947,062	120	31
WSROX	4,412,880	140	40	W3GYQ	2,888,912	114	38
W6PBV	4,026,135	99	40	WIKQY	2,730.696	119	40
W2KHA	4,008,786	139	35	W7GPP	2,707,968	90	38
W9ILH	3,968,803	112	45	W2LMN	2,625,036	98	40
W8LII	3.877.440	122	46	W5EWZ	2,602,404	96	42
W2KXF	3.711,360	122	38				

OFFICIAL 'PHONE STATION SCORES (OCT.)

Station	Score	\$.080.8	Sects.	Heard	Power (Watts Input)	Operating	Time
W3FJU	6600	53	24	5	1000	7 h.,	54 m
W2HXQ	5740	45	26	31	200	7 h.,	35 m.
W1FBJ	4104	42	18	9	500	5 h.,	30 m.
W1COI	3621	39	17	9	400	6 h.,	30 m.
W2DVC	3168	26	18	23	400	4 h.,	30 m.
W2CHK	3120	30	15	29	100	5 h.,	45 m.
W3HAL	2975	35	17		600	6 h., l	15 m.
WSMBW	2924	30	17	11	150	3 h.,	15 m.
WIKTE	2499	27	17	6	60	4 h., 3	34 m.
WSBFB	2144	24	16	7	250	5 h., 5	i5 m.
Station	Score	080°e	Sects.	Station	Secre	8,080	Sects.
W8KBJ	2100	28	15	W8EQN	1408	20	11
W2CET	2067	31	13	WIAAR	1352	20	13
W3BRZ	2025	21	15	W4BPD	1330	19	14
W3DRQ	2025	25	15	W3FPC	1298	16	11
W1EAO	2010	24	15	W6CHV	1260	15	14
WSROA	1781	91	13	Waksi	1120	16	10

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W4AAK 15

W1ATE

15 W1KZU

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19 12 W2JMX

W7GNJ

W3OQ

WIGZL

W9TRN

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W1EC W9TF W4CY WIKC WIIC W3GF W2JK WAIT W2GI W2AV W3AC

WANG W9GF W9YX W3FL W8OQ WOVE W6AX W8OX

WOER W3G.I W8LC W6PB W6PC W9BQ W4CE WIUE W9MC W7.IC

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High 1939 "SS" Scores

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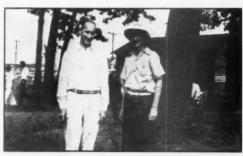
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CQ SS" — the "call heard 'round the world"!! What a contest it was! The 10th A.R.R.L. Sweepstakes has left an impression that will take more than time to erase. Even now, two weeks later, the smoke has not yet cleared away from the field of battle: tuning through the various bands we still hear, "How was your score?" . . . "Made XXXXX points here." . . . "How did WXXXX make out?" . . . etc. We won't attempt to estimate the total participation, but the number of reports received to date indicates a previously unequalled figure. Logs have so far arrived from more than 850 operators, and they are still coming, in big batches, every mail. Knowing that everyone is anxious to know how some of the gang made out, we're listing the "claimed scores" of a bunch of the high pointers. Note that WITS and W8DOD on c.w., and W9RBI and W2HXQ on phone, claim all 64 sections worked (the total is 64 since the 7 VE sections are off the air). W1TS worked all sections on the first week-end! Many operators worked all states in the contest. W8LEC on the second week-end made WAS in a total elapsed time of 22 hours, 45 minutes, with less than half of that time actually spent as operating time! And he did it all on 14 Mc. Additional records undoubtedly will come to light later. The complete official results are scheduled for April QST. The listings following show score, stations worked and sections worked, in that order:

C, W.		W3DMQ	46000
W2IOP	101500-653-63	W3GHD	46000
W9FS	99735-654-61	W3GDI	45820-317-58
W3BES	97000	W2LXI	45630-352-52
W80FN	96797-626-62	WIBIH	45600-383-60
W2GSA	94472-610-62	W6NLZ	45360-305-60
WITS	83120-520-64	W7EK	44820-374-60
W8DOD	82800-523-64	W3BKZ	44368-378-59
W8OKC	77216-526-59	W1KFN	43120-392-44
W7CMB	76151-485-63	W3FSP	42798-323-53
W8NLQ	76125-525-58	W6MUO	42630-295-58
W9RSO	76097-499-61	W7GPP	42487-315-55
W9YCR	70293-457-62	W9WTW	42240-353-60
W2HHF	70009-451-63	W3GET	42000
W3ATR	67270-481-56	W2IRV	41918-312-54
W3GHM	67000	W7UQ (W9	
W3FRY	63000		41850-271-62
WIEOB	62221-408-61	W8SBV	41310-306-54
W9TH	62220-408-61	W3KT	41000
W4CYC	61876-420-59	W9MIN	40745-281-58
W1KQY	61180-437-56	W3HLZ	40530-387-42
W1ICA	61076-401-61		
W3GRF	60000	'Phone	
W2JKH	59500-425-56	W6ITH	55800-450-62
W8JTT	58725-406-58	W9RBI	44504-280-64
W2GUP	57348-486-59	W6QEU	37250-302-50
W2AYJ	57000-397-58	W5BB	31124-252-62
W3AGV	57000	W9YQN	31000-250-62
W8NCJ	55825-385-58	W6DTB	29610-235-63
W9GKS	55676-356-63	W9ZTO	27592-242-58
W9YXO	55370-399-56	W2JUJ	25300-232-55
W3FLH	55000	W2HXQ	24448-191-64
W8OQF	54312-438-62	W9NDA	23790-196-61
W9VBQ	54290-357-61	W6AM	23659-201-59
W6AXC (V	V6BBR, op)	W7HEY	22880-211-55
	53485-346-62	W9UVA	21862-165-55
W8OXO	53350-390-55	W9ZVX	21708-204-54
W9ERU	53238-467-57	WIATE	21417-184-59
W3GJY	53000	W9PNX	21340-194-55
W8LCN	51584-417-62	W4DRZ	18821-163-59
W6PBV	50250-338-60	W6FUO	17808-168-53
W6PCE	48825-316-62	W3HDJ	17690-153-58
W9BQJ	48400-352-55	W9ZIX	17600-161-55
W4CEN	48203-411-59	W9GDB	15480-137-48
WIUE	47925-321-60	W9KQX	15360-130-48
W9MGN	47250-316-60	W9KOH	15126-181-46
W7JC	47100-398-60	W7FQT	14750-154-50
W8PSR	46480-332-56	W9ADJ	13464-132-50
W9AOB	46207-306-61	W8CWY	13409-128-53

W9UYD	13197-125-53	W1JNX	12341-144-43
W5DYT	13160-141-47	W6CHV	12000-100-48
W7GNJ	13008-136-48	W3GWQ	11045-118-47
W6QOZ	12690-143-45	W8JM	10165-114-38
		W6IMV	10105-111-47



The New Jersey S.C.M.'s

Pat Jessup, W2GVZ (left) and Les Allen, W3CCO (right) took office as S.C.M.'s for the Northern and Southern New Jersey A.R.R.L. Sections, respectively, in the early summer of 1939. Asst. S.C.M. Ed Raser, W3ZI, snapped the photo at the Delaware Valley Radio Ass'n Outing at Trenton, Aug. 6, 1939. "Pat"is active in practically every phase of ham radio, being an E.C. and R.M., member of the DX Century Club, ardent ragchewer, and a heavy traffic handling O.R.S. "Les," who does most of his operating on 'phone, is also a busy man as president of D.V.R.A., attending to the multitudinous tasks of an S.C.M., issuing bulletins for the S.N.J. ORS Net and the Section, etc. Two real hams, both doing a "crackajack" job as S.C.M.!

Contest Score Corrections

We are advised by the VE/W Contest committee that W2GSA's correct score in that contest was 27,082 (138 contacts). This makes GSA the second highest scoring W operator.

In the '39 Field Day results the score of W3RR/3 should have been listed as 1002 (88 contacts) instead of 534.

Winner of the club certificate for the Antwerp Radio Club, ON4BC, in the '39 DX Contest was ON4IF, rather than ON4PW as indicated in Oct. QST. Additional information received after the DX contest results were published have made possible club awards in the Dayton Amateur Radio Ass'n and the Birmingham Amateur Radio Club. W8CED won a c.w. club certificate in the D.A.R.A. W4ECI won the c.w. certificate, W4ERX the 'phone award, in the B.A.R.C.

The October meeting of the Western Slope Radio Club (Grand Junction, Colo.) was held at Grand Mesa, highest flat top mountain in the world — 10,000 ft. high, 200 lakes, 26 square miles. Among those in attendance were W9GLT, W9OSD, W9MGX, W9GKW, W9GMB and M. E. Erickson, club president.

New Mexico Weather Net

W5HAG heads the newly formed New Mexico Weather Bureau Net. Under supervision of the U. S. Weather Bureau station at Albuquerque, weather, crop and river level information is supplied efficiently from all parts of the state by amateur radio.

Brad Martin, W3QV, Director, A.R.R.L. Atlantic Division, was laid up in the hospital for quite a period during November. Hospital visits are not an unusual thing, but for Brad it represented the first time since getting his ham ticket that he had been off the air for as long a time as one week. And Brad got the call 3QV in April 1920. That is certainly a record for continuous activity!



Do's blood, but you chaps are persistent! Knowing full well that DX is so low it has to stand on a box and reach up to touch bottom, you are still tenacious enough to sneak a squint at the pillar, in the faint hope that someone uncovered something you missed. Well, a few of them did,

but mostly it's mighty tough going.

All of which reminds us that this might be a very good time for you to catch up on your QSL cards. A lot of our amateur friends in the belligerent and near-belligerent countries have only their fond memories and an occasional radio magazine to keep up their interest and ham spirit, and we feel certain that an odd card or two showing up everytime the postman always rings twice would help a lot. A few of them have their receivers and listen to their old friends, but a card or two would be a tangible thing that would bring a lot of pleasure to our DX friends. Oh, sure - you're just like we are - you don't owe anyone a card. (Jeeves, I did too QSL those fellows!)

That fellow we mentioned last month as having offered the W1 QSL Manager some gear for cards apparently can't take it. He got real sore when he read about it on this page and wrote to W1BGY, threatening him with all sorts of dire this and that. That's the sort of fellow we'd expect to find trying to buy his way into the DXCC but, when it comes to a showdown, all our chips go on the Manager. And why

pick on BGY? - we made the cracks.

WHERE:

F THE guy's really OK, W1TS pulled a nice one by working KH6RZQ (7000-7025 T9), who came through the other yawning between 2 and 4 a.m. The story he told was that he uses 10 watts input and an 8-wave-length Vee, and had only been on a few days. We hope he's legit, because we'd heard that it isn't too easy to get a license out there in Samoa Just so the cards won't continue to come in, don't confuse the Kwantung that XU6W gives for a location with the Kwantung of J8PG (14,300 T7) - they aren't the same place and the XU rates with the rest of China -- the J8P is a separate country XUIA (14,340 T8c), who comes through in the early evening, gives his address as Provincial Health Center, Ninghia, Inner Mongolia, which, if true, would make him the long-sought-for Mongolian and a new country. Inner and Outer Mongolia both rate as Mongolia on the list. W2ZA, W2BHW, W2BJ, W8CRA, WSOSL and W2ARB were among those who snagged him There is plenty of evidence, presented mostly by W2GT and W2AVO, to indicate that AC4JS was in Tibet and not in China as rumored last month. No cards as yet, Mail has been returned from the addresses however ... given by FF3Q, VS9BC and YA5UR Even Jeeves agrees with us about ZB4UC, so it should be easy to cross him off the list Some of the gang are going to be disappointed to learn that they didn't work LZ1ID, but the signal that was active with that call around early October wasn't the real guy and wasn't in Bulgaria. He was in Europe, near there, but got a little too anxious worked UX1CP (14,400 T9) at 23 GT, which should be enough tip if you missed Franz Joseph Land when he was on before. QSL via C.S.K.W. (and keep your fingers crossed!) . Don't waste your time on PZ6ZK W8PQQ got a letter from VR4AD saying he was going to Ocean Island, which should give us all a crack at VR1 when the lads get back on SM5XH has a nice letter and, among other things, confirms your suspicion that TA1AA was just another one for the red side of the ledger.

WHEN:

FORTY was almost as good as 20 last month which isn't saying much for either. W4MR worked HA8D (7020) and W1MEC (the latest HQ 25-hours-a-day ham)

worked HA7YL (7115 T6) around midnight, while W1TS grabbed off the KH6 we told you about. Speaking of the Pacific Islands, W3CWQ thinks these lads out there might well do a bit more listening, since they come through back east well around midnight W7GZN head D4BRI

(7030 T9) at 8 P.M.

It's possible to scare 'em up on 20, but not as easy as it not was W4EV, whom you used to know as once was .. W4APU, has his finger in the pie again and comes out with Panama and LXISS (14,280), while hearing such worthies as CP4CD (14,400 T7) and OQ5BA (14,275 T9) ... includes XU8WS (14,400), J2OV (14,400) and J3DG (14,400) worked in the evening, and XU7A (14,370), XU8MI (14,350), XU8HM (14,400), XU6DX (14,275 Tse), XU5HR (14,370 T7), XU4A (14,360), XU2MC (14,350), J3FP (14,375), J8CH (14,370), PK1TF (14,360), KA1FG (14,340), KAIPO (14,345), KB6RSJ (14,380) and CR6AI W2HHF is in with (14,360) during the early watch ... his usual fine dope, including KAIWW (14,340), UK9AN (14,400 T6), U4AL (14,370), U4AM (14,360 T7), KA1JM (14,310), XUORK (14,360), OQ5IM (14,380), U9AW (14,370 T8), XUSHN (14,360), XUOA (14,290 T8), KAIER (14,370), KAILB (14,270), CR6AF (14,300), HS1BR (14,385), XU5LT (14,290), J2MH (14,400) and KAIBN (14,385), XU5LT (14,290), J2MH (14,400) and KAIBN (14,280), CT4AA (14,400) and PK3AC (14,350 T8) were heard W8PQQ received cards from LX1RB heard (14.350 T9x), LX1SI (7050 T9x), J9CA (14,360 T9x) and J8CG (14,380 T9x), in case you were wondering about any of them.

PHONE:

W1WV HAS been putting in some time on 10 phone, and passes along the word that pickings aren't too bad down there, what with OQ5AB, HA1K, EA7BB, HC2CG, HC2CC, LU7DQ, LU9BV, TI3AV, TI2RC, CE3AG, HC1JB, PY2AK, YV5AK and CE3CZ on YVIAQ (28,200), CEIAH (28,290), XU8ZA (28,120), XEICO (28,340) and TG9AA (28,350) to the above.

On 20, the only dope we have is from W6ITH, who says his new rhombics are really laying down a signal. The stuff worked includes about everyone on the air: CE3AG (14,-150), LU7BK (14,085), CE3CK (14,010), CX2CO (14,070), LU5AN (14,050), CE3AC (14,010), CE3EW (14,090), LU6DJ (14,075), J2NQ (14,040), K7HCX (14,240), KAILZ (14,150), J2NG (14,110), EK1AF (14,070), CE1AH (14,040). OA4C (14,265), HCICC (14,250), CX2BK (14,120), K4FKC (14,155), PY2AC (14,100), LU5EZ (14,000), LU5KA (14,005), OA3D (14,065), TI4AC (14,050), LU8AB (14,040), OA4AI (14,015) and J2XA (14,145).

The second 'phone station to reach the 100 mark in the CC is none other than Larry Barton, W6OCH, which, for our money, represents plenty of work, no matter how you look at it. Nice going, mister!

WHO:

W6LPX MADE his WAC with 45 watts to a 6L6G Anyone who hasn't received his card from EI6G can get it by writing to W4CEN, who has the cards and log of the Irish ex-ham XU4XA is apparently off the air for good, or at least until he returns to W, says W2GT ... VU7BR QSL-ed all of his contacts, so if you don't receive his card after a reasonable time, try again.

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tly tly ou in. Since the very beginnings of radio, the amateur has had a brilliant record of achievement. There has been outstanding pioneering, such as the exploitation of the wavelengths below 200 meters fifteen years ago. There has been skillful research, like the important work on the DX characteristics of the ultra-high frequencies now being done. There have been great inventions,

such as the single-signal super from the laboratories of the ARRL. The list is long and impressive.

In addition, technical improvement has been matched by the development of operating skill. Amateurs have shown their resourcefulness in emergencies, establishing life-saving communication networks under conditions that seemed hopeless and coöperating heroically with relief organizations. The value which the Army and Navy place on the amateurs' skill is witnessed by the Army-Amateur Net and the Naval Reserve. And few explorers would care to set out on an expedition without first enlisting amateur help.

This is the brilliant record of the past, but with the new year, a new page in history is turned. What of the future? At the moment, it may appear dubious, but the future is probably FB. Amateur radio is immeasurably stronger than it was twenty-five years ago, when the World War threatened to put it permanently out of existence. It has many friends, a strong organization, and history of achievement. It has capable leadership by men who are proud of a great tradition. We do not doubt their ability to steer the ARRL through the stress of war time, nor do we doubt that amateurs will give them the coöperation that is essential to their success. The future of amateur radio lies in the hands of the "W's", and we are confident that it is safe.

While we are handing out the laurel wreaths, we should like to pass one to the dealers, too. It seems to us that they deserve a lot of credit. Many of them are amateurs, and out of their wealth of experience they have helped many a budding ham to get well started. Generous of their time when an amateur wants to talk over his problems, and quick to meet his needs, they are far more than just merchandisers. We think their service to amateur radio has been very real.

To them, to the League, and to all Hams in every land, we wish a Merry Christmas and a Happy New Year

W. A. READY





MALLORY Vibrapacks

are on 24 hour patrol duty with the Baltimore Police Department

Forty-two Mallory Vibrapacks are in service in the Patrol Cars of the Baltimore Police Department. Powering police receivers on a 24-hour-a-day schedule, these vibrator power supplies are making new records for dependability, economy and efficiency. This performance is not an isolated instance, but is a duplication of the satisfactory operation of thousands of other installations. It is not hard to understand why Vibrapacks are so popular. They provide:

1. Maximum dependability.

Indispensable in police, sheriff, fire department and government applications; valuable in amateur and non-commercial installations; the conservative design, careful workmanship and fine materials of Mallory Vibrapacks insure their reliable, consistent performance.

2. Low service cost, minimum time out for service.

The only part of a Vibrapack which normally ever wears out or requires replacement is the long-life, heavy-duty vibrator.

or requires replacement is the long-life, heavy-duty vibrator. When required after an extended period of service, vibrator replacement can be made in a moment—no tools required.

3. High efficiency.

This means lower drain on the storage battery, longer battery life, less battery servicing, longer periods of operation between charges and a lower charging rate for the car generator.

4. Lower first cost.

An important consideration in this day of restricted budgets. Mallory Vibrapacks are made in 6, 12, and 32 volt models, with outputs up to 60 watts. Get your free copy of the Vibrapack Technical Data Sheet Form E-555-B. Ask your Mallory-Yaxley distributor, or write

P. R. MALLORY & CO., Inc.

Coble Address-PELMALLO



He's pretty good about those things W4ZZ is off on a trip to the West Indies and plans to drop in on as many of the gang as he can find W2GVZ says a lawabiding ham is one who calls a dubious DX station and then hopes it doesn't answer! As far as that goes, a DX man is one who has the cards to prove that such a thing as DX used to exist. Remember?

- W1.JPE

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A.R.R.L. DX Century Club Rules

(1) All contacts must be made with stations working in the authorized amateur bands using amateur calls.

(2) In cases of countries where amateurs are licensed in the normal manner, credit may be claimed only for stations using regular government-assigned call letters. This shall not militate against claimed credits for contacts prior to publication of this section that might otherwise have been claimed earlier. No credit may be claimed for contacts with stations in any countries in which amateurs have been temporarily closed down by special government edict where amateur licenses were formerly issued in the normal manner.

(3) QSO's taking place after December 15, 1939, with any stations in any countries included in any Proclamation of Neutrality of the President of the United States of America, shall not count for Century Club credits. The countries listed in such proclamation are: Germany, France, Poland, United Kingdom, India, Australia, Canada, New Zealand, and Union of South Africa. If further countries are added to this list by the President, QSO's with those countries shall not count from effective date of such additional proclamation.

(4) All stations contacted must be "land stations"... contacts with ships, anchored or otherwise, cannot be counted.

(5) All stations must be contacted from the same state or call area, where such areas exist, or from the same country in cases where there are no call areas.

(6) The A.R.R.L. list of countries, printed periodically in QST, will be used in determining what constitutes a "country." (January, 1939 QST, contains the A.R.R.L. list.)

(7) In cases of countries no longer in existence, credit will be allowed for these, if they were recognized as separate countries by A.R.R.L. at the time of contact.

(8) Confirmations must be submitted direct to A.R.R.L. Headquarters for all countries claimed. Confirmation from foreign contest logs may be requested in the case of the A.R.R.L. International DX Competitions only, subject to the following conditions:

(a) Sufficient confirmations of other types must be submitted so that these, plus the DX Contest confirmations, will total 75 or more. In every case, contest-confirmations must not be requested for any countries from which the applicant has regular confirmations. That is, contest-confirmations will be granted only in the case of countries from which applicants have no regular confirmations.

(b) Look up the contest results as published in QST to see if your man is listed in the foreign scores. If he isn't, he did not send in a log and no confirmation is possible. Logs for the 1935, 1936, 1937, 1938 and 1939 contests only are available. Results of these contests appear in the September, 1936; September, 1936; October, 1937; November, 1938; and October, 1939 issues of QST.

(c) Give year of contest, date and time of QSO.

(d) In future DX Contests, do not request confirmations until after the final results have been published, usually in one of the early fall issues. Requests before this time must be ignored.

(9) In accordance with the Century Club policy as outlined in the How's DX department, April, 1939 QST, all confirmations must be submitted as received from the stations worked. Any altered or forged confirmations submitted for C.C. credit will result in disqualification of the applicant from QST listings as well as from membership in the club. Any Century Club member submitting forged or altered confirmations must forfeit his membership.

(10) Contacts may be made over any period of years, and may have been made any number of years ago, provided only that all contacts be made from the same state or call areas (or country, where no call areas exist) and by the same station licensee; contacts may have been made under different call letters in the same area (for country), if the licensee for all was the same.

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EVERY receiving problem confronting the radio amateur was carefully analyzed during the design of the "HQ-120-X." Three very important features were the result of this analysis. Variable crystal filter selectivity for phone as well as CW reception has had the effect of more than doubling the width of the amateur phone bands. This high degree of selectivity cuts down background noise and hiss as well as general QRM. The next important feature is the calibrated band spread dial making it easy to spot stations with a remarkable degree of accuracy. The third

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feature is the antenna compensator. With this control, the operator is assured of peak efficiency at all times, even with the simplest form of antenna. Your local Hammarlund dealer will be pleased to demonstrate these as well as other outstanding features of the "HQ-120-X."

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Q-1-40

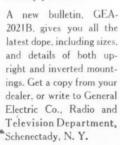


No Pyranol Capacitors?"

Better look again. OM, because G-E Pyranol capacitors are small—so compact that your sock could hold several. If you didn't get some—well—the next best thing is to trot out the dog team and mush to the nearest G-E dealer. He'll gladly supply you with these top-quality transmitting condensers, because he knows they'll give you satisfaction.

G-E Pyranol capacitors are built to rigid specifications, individually tested, guaranteed to oper-

ate at 10 per cent above rated voltage. They're reasonably priced, too.





(11) The Century Club award and QST listings for contfirmed contacts with 75 or more countries is available to all active amateurs, everywhere in the world.

(12) Following the first listing of any station in QST, confirmations from additional countries may be submitted as received, and the original listing will be changed in subsequent lists.

(13) Stations reaching the 100-confirmations mark will automatically be enrolled in the DX Century Club.

(14) Sufficient postage for the return of confirmations must be forwarded with the application. In order to insure the safe return of large bunches of confirmations it is suggested that enough postage be sent to make possible their return by First Class Mail, Registered.

(15) Address all applications and confirmations to the Communications Department, A.R.R.L., 38 LaSalle Road, West Hartford, Conn.

(16) In submitting confirmations they should be accompanied by a list of claimed countries and stations representing each country to aid in checking and for future reference after your confirmations have been returned to you.

We are again printing the Century Club rules, with clarification of certain points, since it has been some time since this information appeared in QST. Kindly refer to the above in preparing to submit confirmations. This will answer practically every question you may have. The rules as they now stand are effective with publication of this issue of QST.

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Virginia radio amateurs were active in furnishing communication for the Norfolk & Western R. R. on November 5, 1939, during a heavy snowstorm which blanketed the She andoah and eastside valleys west of the Blue Ridge. W3BIG. Shenandoah, Va., with 16 inches of snow and all regular communications methods cut off, came on the air at 9:30 A.M. and handled all communication for the N. & W. until regular lines were restored in the afternoon. All a.c. power was off in Shenandoah from 10:00 to 11:30 A.M. W3AVL, Waynesboro, with 12 inches of snow and the same conditions as in Shenandoah, handled traffic for both the N. & W. and Western Union. W3BTM, Roanoke, handled all traffic from W3BIG and W3AVL, maintaining direct telephone communication with the N. & W. Roanoke dispatchers' office. W3AHQ, Staunton, when power went off in Shenandoah, started for that city with emergency equipment, stopping at W3DWE and W3EPK for additional gear; he was held at W3EPK by word that power had been restored. W3CNY, Roanoke, went to Shenandoah on work train to help with communications. W3AVL, Waynesboro, met the train carrying W3CNY, with a portable transmitter for use in Shenandoah. The following participated in relaying messages and clearing the frequency used: W3AIJ, W3DPV, W3DWE, W3EPK, W3FBR, W3FGJ, W3GWQ, W3UVA

A.R.R.L. Code Practice Stations

The following amateur stations are transmitting code practice on regular schedules, as listed:

S	tation	Frequency	l Days	Hours
W1JBV	Conn.	1808 kc.	Tues. & Fri.	8:00-8:30 p.m. EST
WIJNU	Mass.	1978 kc.	M-T-T-F	6:30-7:00 P.M. EST
W3BHE	Maryland	1888 kc.	Mondays	8:00-8:30 P.M. EST
W3HBE	Delaware	1915 kc.	Fridays	6:00-7:00 P.M. EST
W6DPT	Calif.	1790 kc.	Mon. & Thurs.	7:30-8:30 P.M. PST
W6HUX	Calif.	1960 kc.	Mon. & Fri.	7:30-8:30 P.M. PST
W8CBI	Ohio	1990 kc.	Tuesdays	6:30-7:30 P.M. EST
W8NQS	Michigan	1952 kc.	M-T-W-T-F	7:50-8:10 A.M. EST
W8QBU	New York	1815 kc.	Wednesdays	7:30-8:00 P.M. EST
W8RFM	Penna.	1814 kc.	Mon. Wed. Fri.	6:30-7:00 P.M. EST
W8SDO	Ohio	1989 kc.	Mondays	6:30-7:30 р.м. EST
W9BB	Nebraska	1950 kc.	M-T-W-T-F-S	7:00-8:00 P.M. CST
W9BSP/U	JA Kans.	1903 kc.		7:30-8:30 P.M. CST
W9CHJ	Kansas	1921 kc.		6:30-7:30 P.M. CST
W9MWU	Illinois	1919 kc.	M-T-W-T-F	5:00-5:45 P.M. CST
W9NAA	Indiana	1875 kc.	M-T-W-T-F	6:30-7:30 P.M. CST

Attention is also called to the "Official Broadcast Schedule" of A.R.R.L. Headquarters station W1AW (elsewhere in this issue). These W1AW transmissions are sent at constant rates of speed and provide good practice, especially for the man who wishes to get beyond the 13 w.p.m. stage.

76

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With Adaptations for PLATE MODULATION and P.A. WORK

DESIGNED AND ENGINEERED BY TEMCO

Manufacturers of Quality Amateur Gear

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- Output taps from 40 to 3000 ohms in practical steps.
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 Real "Professional" appearance.
- Extremely Economical! Build it yourself and use some of those "spare parts".
- Interchangeable Output transformers make these kits UNIVERSAL*

*Complete chart shows the many applications possible. See Special literature at your jobber's for a correct transformer to suit your application.

THE KENYON '50'

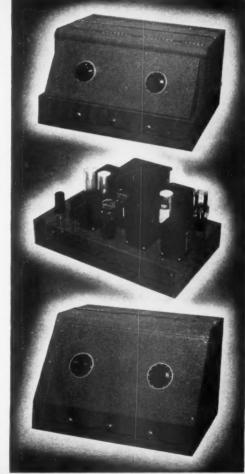
(See top illustration.) Uses 6F6-6SF5-6H6-6SJ7-80. Conservatively rated at 5 watts Class A. 110 db Gain. Basic kit consists of Par-Metal punched deluxe chassis with screen cover and 5 KEN-YON QUALITY TRANSFORMERS. Amateur net price of Foundation Kit. \$18.75

THE KENYON '150'

(See middle illustration.) Uses 65J7 6C5-6H6-80-pp6V6. Conservatively rated at 15 watts Class AB. 110 db Gain. Basic kit consists of Par-Metal punched chassis, sloping front cabinet and KENYON QUALITY TRANSFORMERS. Amateur net price of Foundation Kit. \$22.78

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All three KENYON AMPLIFIERS are modern in design with sloping front cabinets. Your jobber can supply you with the basic kits as well as all other needed parts. Complete literature, parts list and data sheets are slic available. If he cannot supply you, write us direct giving us his name and we will see that your order is filled.





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"When the organ plays at twilight" can you still hear the LOW notes when the volume

With Old Man Centralab at the console you get true tone compensation . . . for his Standard and Midget Radiohms are available with 1, 2, 3 taps to match the original control.

Wherever tapped controls are indicated be sure to use Centralab with the long straight resistor strip that gives smooth accurate attenuation throughout the entire circumference.

Old Man Centralab suggests:

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With short wave listening on the up, Centralab Wave change switches do the trick . . . better.



DIVISION OF GLOBE-UNION INC. Milwaukee, Wisconsin

MEMB	ERS	, DX	CEN	NTU	RY	CLU	R
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	44 G5RV	114	WIGDY	. 10
W2GT 1	44 W8BKP	114	W9CWW	. 10
W2GTZ 1	49 WINN	114	Wannay	. 10
WZGIZ I	42 W1WV	114	W2BMX	. 10
W1TW 1	41 W2DC	114	W8LFE	. 104
W2GW1 W6KIP1	41 G2DH	114	G6KP	. 103
W6KIP 1	40 G5BY	114	W8KKG	. 103
W9TJ 1	40 W2CJM	113	J2JJ	. 103
W8DFH 1	39 W4DRD.	113	W5CUJ	. 103
W1SZ 1	37 W8MTY	. 113	W3KT	103
W1SZ 1 ON4AU 1	37 G6CL	112	W1ZI	103
G270 1	SE WECAL	112	W8DOD	103
G2ZQ 1: W3EMM 1:	e Warut	112		
Wacanini I	OF WACKII	112	W9NNZ	103
W6CXW 1: W1TS 1:	36 W3EVT 35 W4CYU 34 W3GAU	112	W2GNQ	103
W115 1	34 W3GAU	112	W410	103
W1LZ 13	33 WIADM.	112	W3GEH	103
W5VV 1 G6RH 1 W8BTI 1	33 W8QXT	112	W6AHZ	103
G6RH 13	32 WZAAL	111	WACDV	102
W8BT1 13	32 W3BES	111	W8AU	102
W4BPD 13	Z ONAIII	110	WSOXO	102
W8DHC 1: W2BHW 1:	1 PAØXF	110	WIFTR	102
W2RHW 1	W6FZL	110	Wanya	102
W5BB 13	O VESAV	110	W8AU W8OXO W1FTR W2BXA W1GNE W4BVD	102
W5BB 13 W3CHE 13		110	WIGHE	102
WJUIE IS	WZDSB	110	W4BVD	102
HB9J 12			** 6/3 *	102
W8OSL 12	29 W2AER		W3ZX	102
W2CMY 12	9 W8IWI	110	F8RJ	101
W1FH 12	8 W5QL	110	F8RJ VK3KX	101
W1FH 12 W3EPV 12 W8OQF 12	8 W2IYO	110	W6DOB	101
W800F 12	7 W3DDM	109	SUIWM	101
W8ADG 12	7 W6FZY	109	W8EUY	
W9KG 12		109	WICC	101
W2UK 12	6 W3FQP	109	WICC SUISG	101
W2UK 12 W2HHF 12	6 W6HX	108	CCMAN.	101
Wallir 12	WONA	108	G6MK	101
W9ARL 12	5 ZS2X 5 W1DUK	108	W6AHZ	101
W2ZA 12	5 WIDUK	107	W4MR	101
W1DF 12		107	W6GHU	101
W2JT 12		107	W6BAM	101
W2JT 12 W8DWV 12	3 VK2DG	107	W6KWA	101
W8LEC 12	3 W7DL		WIRY	101
W4CEN 12	3 W6MVK	107	W1RY W4EQK	101
D4AFF 12	3 VK3QK		VK6SA	101
W8NJP 12	2 W1BXC	107	G6NF	100
W9TB 12	2 WIIAS	107	Werdi	100
W9TB 12	4 WIIAS	107	W6KRI W9UQT	100
W3EDP 12	1 G2TR	106	W9UQ1	100
W8JMP 12	0 W1CH	106	VE2EÈ VK2ADE	100
J5CC 12 W2GVZ 12	0 W3AG	106	VKZADE	100
W2GVZ 12	0 W6TJ 9 HB9BG	106	ZL1GX	100
W9GDH 11	9 HR9RC	106	HB9X	100
W1JPE 11	WIBGY	106	W9RCQ	100
W3FRY 11:	9 G2MI	. 106	ZL1MR	100
W1BUX 11	8 VE3QD	106	PAØQF	100
ZL1HY 11	8 HB9CE	. 106	Werse	100
W9ADN 11	8 W2VY	. 106	W8BSF D3BMP	100
W9FS 11	8 W2OA	. 105	W3AGV	100
W313 11	CEOV	105	WOAUV	100
W7AMX 11		. 105	W8JTW	100
W9PST 11	VK3CX	. 105	W8HGW	
W1AXA 11	WIICA	. 105	W8JAH	100
W3EVW 110	6 W2IOP 6 W4TO	. 105	W9LBB	100
W5KC 110	W4TO	. 105	W4CCH	100
W2BYP 116 W6ADP 115	W8LYQ	. 105	W2ARB	100
W6ADP 11!	W9RBI	. 105	W5ASG	100
W9EF 11	EISF	104	W8JIN	100
VK5WR 115	W178	104	Radiotelephon	200
W2CYS 115	W1ZB W4AJX	104	W9 A 7	102
W1HX 115	F8RR	104	W2AZ W6OCH	100
W1111A 113	ronn	. 104	WOUCH	100

W2CYS... 115 W4AJX... 104 W2AZ... 102
W1HX... 115 F8RR... 104 W6OCH... 100
The following have submitted proof of contact
with 75-or-more countries: W8AAJ, W9VDY,
W8QDU, W9AJA 99; W2ALO, W2BJ, W6ADT 98;
G6GH... W1OZ, W2JME, W4TP, W8LZK 97;
W1AVK, W2CTO, W8BOX 96; F8LX, FBSAB,
G6XI... W3AIU, W3EMA, W8IQB, W8PQQ 95;
W3AOO, W3FLH, W8CJJ, W9BEZ 94; G6ZO,
ON4GK, PAØQZ, W2WC, W3OP, W4TZ, W6FKZ,
W6MEK, W6TT 93; SP1LP, W3GHD, W4DMB
92; W9GBJ 91; D3CSC, G6YR, LU7AZ, ON4FE,
SP1AR, W1CBZ, W8KTW, W9JDP 90; W1KHE,
W2CUQ, W8AAT 89; G2DZ, W3JM, W9PGS 88;
G8IG, W2BZB, W6GPB, W0AEH 87; W1BGC,
W8DAE, W9FLH, W9VKF 86; VK2TI, W1DOV,
W4CFD, W6GK, W8LAV 85; SM6WL, W1BFT,
W6AM, W8BWB, W9OVU 84; OZ7CC, VE2GA,
VK3HG, W2AWF, W2FLG, W6DTB, W6KUT,
W8BFG 83; E14J, W1EWD, W3AYS, W8BWC,
W8OUK 82; W6NLZ, W9GY, W1BPN, W2BNX,
W2HTV, W3BVN, W3EPP, W4OG, W6LDJ,
W8DGP, W81TK, W9DIR, W9GKS, W9GMV 80;
PY2DN, W3EUJ, W8CED, W8JFC, W9MRW 79;
W3DRD, W4EPV, W8FJN, W9YNB 78; G3BD,
LA2X 77; PAØJMW, W3BSB, W9HUV, ZE1JI 76;
W1EH, W4AHF 75.
Radiotelephone: W2GW 99; G5RV, W2IXY,
W4CYU 89; W3EMM 86; W8LFE 84; W1AKY 81;
W2IKV 80; W1ADM 78.

HRO maximum gain pres noise rati

including NC-100 Receivers heterody

speaker a reception NC-101) include o plete cor List Price coils and prices be

NC-44 price. A tinuous o oscillator coils, po

* Compl equipme



HRO A professional receiver, designed for maximum performance. Features include two high-gain preselector stages giving exceptional signal to noise ratio, crystal filter, micrometer dial, S meter, AVC, Beat Oscillator. List Price \$342.50* and up, including coils, speaker and power supply.

NC-100A & NC-101X Fine Communication Receivers with splendid tone. These 11 tube superheterodynes are self-contained except for the speaker and are equipped with an effective noise limiter. The NC-100A series is ideal for broadcast reception as well as communication work. The NC-101X covers only the amateur bands. Features include one stage of preselection as well as complete communication equipment. For the NC-100A, tist Prices begin at \$200.00*, including speaker, coils and power supply. For the NC-101X, List prices begin at \$215.00*, with crystal filter.

NC-44 For capable performance at very low price. A seven tube superheterodyne with continuous coverage from 550 KC to 30 MC. A CW scillator is provided. List Price \$82.50*, including coils, power supply and speaker.

NHU A specialized communication receiver covering the range from 27 to 62 MC. The NHU is a high performance superheterodyne provided with all features and controls commonly needed in communication work, including a wide range crystal filter. List Price \$304.50*, including speaker, coils and power supply.

ONE-TEN A specialized receiver for the range from one to ten meters. The One-Ten receiver is intended primarily for the experimenter. It is a thoroughly satisfactory receiver for the ultrahigh frequencies. Four tubes are used; RF (954), superregenerative detector (955), first audio and output audio. List Price \$85.00, with coils but without tubes, speaker or power supply.

SW-3 A dependable regenerative receiver. The SW-3's eight year reputation for performance and dependability give it preference for many classes of work. It uses three tubes in a highly developed circuit that provides maximum sensitivity and flexibility. Coils are available to cover the range from 9 to 3000 meters. List Price \$35.00, without coils, phones, tubes or power supply. Coils list at \$5.00 per pair for all ranges below 200 meters.

*Complete price listings will be sent on request. The prices given above are for AC models with complete equipment. With less complete equipment, the price will be lower in most cases.

NATIONAL COMPANY, INC., MALDEN, MASS.

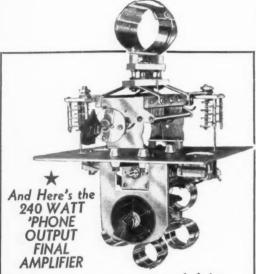
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CARDWELL Midway Transmitting Condenser helps grind out a conservative 35 watts of driving power — on 5 bands, for any 240 watt amplifier.

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Not a kit we are trying to sell you - just a tested layout for the new RCA 812's, Taylor T-55's, HK-24's or similar tubes, which can be easily driven by such an exciter as the Browning.

Includes:

- CARDWELL "AFU" Foun-
- CARDWELL EU-100-AD Trim-air dual
- · Barker & Williamson coils and baby turret

Write for free drilling templates and directions Transfer this tested layout to your chassis, where you want it

THE ALLEN D. CARDWELL MANUFACTURING CORPORATION 83 PROSPECT STREET, BROOKLYN, NEW YORK

Forty Traffic System (FTS)

Some 200 stations are now enrolled in the Forty Traffic System. All stations in the "FTS" group are urged to operate within the 7200-7250-ke, region of the 7-Mc. band, although stations outside this sector are also invited to join. Organization of the "FTS" started in March, 1939, and has been carried on by Nils Michaelsen, W2LSD, O.R.S. It has as its purpose the furtherance of message handling in the 7-Mc. band and the bonding together of operators interested in traffic work. Membership is open to any licensed amateur using 7 Mc., provided he will agree (1) to maintain at least one regular ninety-minute operating period per week from 2000-2130 EST (the "FTS" traffic hours); (2) handle any message within a 36-hour period; (3) solicit messages from friends and acquaintances; (4) cooperate with all stations, FTS or not; (5) use the 24-hour method of time keeping; (6) make use of the general call "CQ QRU FTS? DE . . . during the FTS traffic hours and at other convenient times.
W2LSD issues an FTS bulletin, "Etherettes," which goes to all members. Anyone interested in joining the Forty Traffic System, or securing further information on same, should get in touch with W2LSD at 55 Temple St., Harrison, N. Y. Included in the FTS Roster are the following stations, many of them being O.R.S. with connections to the regular A.R.R.L. organized traffic routes on the 3.5-Mc. band: W1AJ BDU DEU GMR GWK JAM JDP JWA JZB KCQ KKS KRX KVT KYB KNJ LAL LDD LFB LGJ LJF LLA LMN LMO LNE LNN LOB LPX LRK LRP LSE LTT LVV MCX UE W2AEU BXP CKQ CZN DBW GBJ GXR JDC JRT JUC JWF KJU KKR KKW KKX KMZ KXZ KZU KZX LEL LHP LME LMN LMR LPJ LQP LSD LWP LXA LXI LZR MAK MCI MDE MEI MGG MII USA W3BHP EEW EGN EUC FUM GGP HDP HDW HEZ HFG HGK HHR HLQ HLZ HQX HRD HRS HSP HTI HWV HZV IAJ IBG RR W4AKC BWV CQX DIJ DNR ECH FDB FRH FTS FRU GAG GGD W5CWW ELW GSD HJF HNO IFD W6JUF LTJ NGC RAM W8BOB DKL ECY EHA FEO FNT KNP LXR MGT NCJ NZH PAB PTJ QCU QER QIM QQK QYK QZH RAP RIM ROB RUF RVF RVR RYQ SCW SFC SJF SNW SQU SVH TEL TEO TNA TRB **W9**AGI BQC BRD CRK CXQ DIJ EIH EYH GGG HOE IIL ITH JKI KBL KUF LAR LNQ LPD MJN MPW MUX NZF ONL QIN QKL RPW RWS TGK UYP YDR YKG YTS YQM YWH ZDS ZJP

College Ham News BY NIILO E. KOSKI, W7LD*

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CHAPTERS of Rho Epsilon at Washington State College, Univ. of Washington, Armour Institute of Technology, Montana State College, and Tri-State College have begun activities for the year. The National Intercollegiate Press Ass'n, an activity of Rho Epsilon, is underway with W7GWT, W7YH, W7HIX, W9YW, W9HPE, and W9VGT active. Stations at other colleges may become affiliated by writing to the national N.I.P.A. manager, Sigmund Mentzel, W9PBT, 4819 N. Melvina Avenue, Chicago, Ill.

Rho Epsilon is making a survey of college radio clubs by means of questionnaires. The first of these is entitled "Financing a College Radio Club." Clubs not having received a questionnaire are requested to write the National Secretary for a copy

W9YW, Epsilon chapter's station at Armour Tech. in Chicago, expects to work the new Antarctic Expedition which Admiral Byrd is leading. Schedules may be maintained with the "Snow Cruiser." A rotary beam on 28 and 14 Mc. and a kw. input will do the job on 'phone and c.w. Classes in code instruction for beginners are held at the Zeta Chapter at Montana State College. The chapter's station, W7HIX, is on the air with 250 watts input. The station of Eta Chapter's President, W9HPE, is the official Eta Chapter station for 1939-40 at Tri-State, Angola, Ind. Chapter members are securing sweaters with the Rho Epsilon emblem attached. Officers of the chapter include W9HPE, President; W5GWK, Secretary; and W6NMH, Treasurer, Beta Chapter at the U. of Wash. is holding monthly dinner meetings open to all campus hams. Twentyfour were present for the first meeting at which W7EAW described his experiences hunting bulls on Chirikof Island, * National Secretary of Rho Epsilon Fraternity, 5822 E. Green Lake Way, Scattle, Wash.

(Continued on next left-hand page)

80



... that's where the similarity ends. For one of these capacitors was built by Cornell-Dubilier, and that means built with greater care—extra quality at no extra cost. Take the C-D Type BR "Blue Beaver." Here's a space-saving unit that offers exclusive electro-chemical etching

-eliminates corrosion; hi-formation process — affords higher voltage breakdown; — better impregnation, lower power-factor; special C-D super-purity cellulose separator—extra bing life; double ageing — stable characteristics; all aluminum tubes and accessories — prevents galvanic corrosion; special vent — safety under all operating conditions; compact libular construction — allows ease of wiring into circuit.

Amateurs who want the most-for-the-money get it in C-Ds. Be specific — order capacitors by name. Your jobber will appreciate it, for he knows the difference. Type BR's described in catalog No. 175A free on request.

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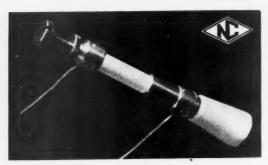
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ELECTRIC CORPORATION

1013 Hamilton Boulevard, South Plainfield, New Jersey
Cable Address: "CORDU"



• For convenience the new models of the NC-600U Neutralizing Condenser are now provided with a small stand-off insulator for chassis mounting. For pig-tail mounting, the insulator may be unscrewed and used for other purposes. Type NC-600U Neutralizing Condenser, List Price \$.55 with insulator. Type NC-600, without insulator, List Price \$.45



• The R-100U and R-300U Chokes are likewise available with the removable stand-off insulator. Type R-100U has an inductance of 2½ mh and a current rating of 125 ma. Type R-300U has an inductance of 1 mh and a current rating of 300 ma. Type R-100 and Type R-300 are similar but without the stand-off insulator. List Price, Type R-100U or R-300U, \$.60. List Price, Type R-100 or R-300, \$.50



• The Type SPG Safety Plate Grip is of molded R-39 and is an important aid to safety when using 866's or other tubes having 9/16" diameter caps. The conductor opening is large enough to receive high tension (spark plug) cable, but an insulated bushing is supplied for smaller wire. Type SPG, List Price, \$.35

NATIONAL COMPANY, INC. MALDEN, MASS. a small island 100 miles off the coast of Alaska. W7GWT participated in the Sweepstakes Contest with members keeping a continuous watch. Chapter President W7ESK was highest scoring W7 on 'phone in the last DX contest. The members are building and experimenting with 112-Mc. pack sets for use at track meets and crew races. Members of Alpha Chapter at W.S.C. have rebuilt W7YH for N.I.P.A. work, and have a new NC100X receiver. Charter members of the new Theta Chapter of Rho Epsilon at the Newark College of Engineering include W2KBS, W2HIT, W2JSX, W2KCN, W2IZP, W2LGV, W2JBI, W2MHJ and W2GFW. The chapter station is W2JPK.

W1KQA is a member of the Univ. of Alabama track team. The U.A. Radio Club has a 100-watt 'phone and e.w. transmitter in the new Engineering Building. W9DAH is assistant professor of physics at South Dakota State College; W7EZL is physics professor at Oregon State College. W7HTZ is located in the SAE house at O.S.C. W9VGT holds N.I.P.A. schedules from Ripon College, Wis. Several local amateur radio fraternities are Rho Sigma Tau at Drexel Institute, Sigma Rho Epsilon at Los Angeles City College, and Synton at the Univ. of Ill. In addition to W7GWT, two other stations on the U. of W. campus are W7DHC of the Naval R.O.T.C. Radio Club, and W7FWT of the Engineers Radio Club. W3DL is on 3.9-Mc. 'phone from the Univ. of Va. W3UVA has gone to Randolph Field for training and has a portable on the air. The Cal-Tech Radio Club has recently been organized at Pasadena, Calif. W6RRO is the club station.

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BY WM. THOMPSON, W6PMV

T was nine-twenty on the evening of the fifteenth and Henry had just sent the last QRU and signed with the gang on the trunk line. It had been a pretty fair evening. Four from Hawaii had been cleared to Denver, twelve deliveries were made, and the hook was as clear as the 7-Mc. band at ten on Monday mornings. Joe and Ed were still chewing on the T.L. frequency. Headphones laid aside, Henry was preparing to start the task of filling out the report to the S.C.M. The month's accumulation of traffic would make a nice total, thought our hero, as he began to sort the sheets into relayed, delivered, extra deliveries, and originated piles. After all, the B.P.L. roster would hardly be complete without Henry's call. Hadn't he made it regularly for the last fourteen months? Hadn't the S.C.M. stated W6XYZ has the usual fine total" in the last issue of QST? "If all the reporters came through like I do, what a Section we would have!," thought Henry, gazing fondly at the O.R.S. certificate hanging on the shack wall.

It was twenty minutes later before Henry finally began to add the respective totals. No - were his eyes deceiving him - they must be; yet, there were the cold figures 498!!! This was terrible! A second count only succeeded in confirming the awful truth. After thirty days of hard work, was this to be the reward? With two less than the required number and with only thirty-seven deliveries, poor Henry was in mental agony. He wasn't the kind who could merely write 500 or 502 on the report blank and forget about it. Something must be done! There was only one thing to do! It was almost ten, two hours remained before the deadline. Here was a chance to originate that long-contemplated message to the old YL friend in Sawbuck, Ohio. Tearing a sheet from the pad, Henry typed: NR215 W6XYZ CK14 LOSA NFT — Well, there was one, but two were needed. Oh yes, he just remembered about that request to A.R.R.L. for that Red Cross poster. That would do the trick and kill two birds with one stone. In no time at all, NR216 rolled

off the mill and Henry began to unwind the receiver dial. After noting that the T.L. gang had QRT on 3.5 Mc. by this time, the rig and receiver were shifted to 7 Mc. Henry decided a snappy CQ TFC EAST would do the trick. The TZ40's hummed, the plates of the '66's spread a hue of blue upon the baseboard, and Henry waited. Ah, there's an answer—"W6XYZ DE VE5FMG VE5FMG VE5FMG VE5FMG AR." These fellows that disregard directional CQ's!!! On went the dial—ah! a nice loud one—"DE W6XXX AR." This was too much. "Call CQ Ohio and raise Canada and California; maybe I should take up knitting," growled Henry between curses. Still, he needed those two points. The next fifteen minutes were wasted scanning

(Continued on next left-hand page)

3,527°C v.s. 1,452°C

Taylor WONDER Tubes
T-40 and TZ-40 Built to Take It-AND THEY DO!

ere's Why...

BWT nbers

-Me. .P.A. nbers

JSX. JFW. track l e.w. DAH State Col-

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dial. 5 Mc.

The plus features built into every Taylor Tube result in greatly increased safety factors, longer dependable life and better all 'round performance. COSTLIER TO BUILD, Taylor T-40's and TZ-40's, with their heat resisting, complete molybdenum grids and rugged carbon anodes, represent the utmost in true value.

STANDS 800% to 1.000% OVERLOAD

Taylor's Wonder Tubes, T-40 and TZ-40, with the famous "Processed" Carbon Anodes, are able to withstand tremendous temporary overloads without injury. The extremely high melting point of the Taylor Carbon Anodes is 3,527°C as against 1,452°C for a nickel anode. An overload of only 300% will puncture the average nickel anode while the Taylor Carbon Anode will stand an 800% to 1,000% overload without damage. A T-40 or TZ-40 can be operated at 225 watts input in class C telegraphy service and 156 watts input in class C telephony. See pages 5 and 6 of November QST for increased ratings. The new ratings can be applied to all T-40's and TZ-40's now in use and in dealers stocks.

OVER 20.000 ALREADY IN SERVICE

Your best proof is heard on the air. Satisfied Amateur users take pride in boasting of their T-40's and TZ-40's in all classes of Radio service including operation on 112 MC. The Wise Amateur will insist on Taylor's Wonder Tubes thru comparison. Every T-40 and TZ-40 is actually tested at 300 watts plate dissipation before it leaves the factory. Again we say-"They Cost More to Make and They Do More for You"!

Recommended by Leading Parts Distributors



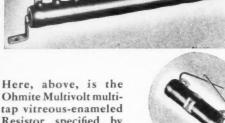
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Send us five cents in stamps or coin and it will be mailed direct from the factory, or at your parts distributor FREE. Contains new circuits, technical data, tube uses, building information, etc.—a real up-to-the-minute storehouse of valuable information.

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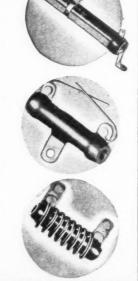




Here, above, is the Ohmite Multivolt multitap vitreous-enameled Resistor specified by Frank C. Jones in his system of Cathode Modulation. It provides the exact control needed in order to secure the proper impedance match of the modulator to the filament or cathode circuit of the final r.f. amplifier.

And here, too are other outstanding Ohmite parts used in the circuits for trouble-free dependable operation. * Brown Devil Resistors. 10 and 20 watt sizes. 1 to 100,000 ohms. * Dividohm Adjustable Resistors. 10 to 200 watts. * Fixed Resistors. 25 to 200 watts. In all standard resistances. * Center-Tapped Resistors. 1 watt and 10 watt sizes. 10 to 200 ohms. * Parasitic Suppressor. To prevent u.h.f. parasitic oscillations.

Get them from Your Johber Write Now for Catalog 17



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the high end of the band, as there wasn't a single W8, W3, or any station even near Ohio coming through. "Short skip," mused Henry. The dial was resting untouched; Henry was through. Why bother with B.P.L. anyway? Now would be a good time to forget traffic and put the rig on 1.75-Mc. 'phone! — Wait! What was that? "W6XYZ DE W6ZYX/6 QSP LA? AR." One last chance, thought Hank, coming back. "QTH? QTC? BK," rattled off Henry's bug. "BK QTH mountain camp bear lake BT QTC? LA QRV? BK." came back. Heaven couldn't be any nicer, thought Henry, as he took them solid. That last "TU OB VY 73" was sent with real feeling this time, as our hero typed 505 in the space provided.

"Now to put these all under the table in the filing box and then see what the little woman has in the ice-box," gloated Henry, as he kneeled under the desk. "A fine place to leave old scrap paper," he thought, seeing several sheets of paper over in the dusty corner on the floor. Not really—yes, actually—messages dated this month—seven of

them!

0.B.S.

The following is a supplement to the list of A.R.R.L. Official Broadcasting Stations in October QST (page 76); W1KKS, W1ZE, W3FJU, W4AZT, W6FZQ, W6MFH, W9FXM.

The "California State" - WTDQ

The training ship California State, operated by the California Nautical School, will depart from San Francisco on January 18, 1940, for a cadet training cruise, which will last until May 1st and take the ship through the Panama Canal to Cuba, Puerto Rico, and along the east coast of the U. S. to Washington, then back to San Francisco. The California State is authorized to communicate with licensed amateurs, and it is desired to work as many 14- and 7-Mc, amateur stations as circumstances permit. The ship's call is WTDQ and operation is on the 18-, 24-, 27- or 36-meter marine bands. It is contemplated that during the cruise period a couple of hours each evening will be set aside for amateur QSO's. Any operator wanting schedules with WTDQ should write immediately to E. L. Robberson, W6ADH, Communication Officer, T. S. California State, Tiburon, Calif.

Ohio amateurs: W8ELC requests immediate return of all petitions filled out as per October QST, so these can be used in the move for special auto tags.

See Page 100 for Station Activities

A.R.R.L. HEADQUARTERS OPERATORS

W1AW, A.R.R.L. Headquarters: Hal Bubb, "Hal," Stn. Eng. and Chief Opr. George Hart, "Geo," 2nd Opr. See others, below.

The following calls and personal signs belong to members of the A.R.R.L. Headquarters gang:

members of the A.R.R.L. Headquarters gang:
W1BAW, R. T. Beaudin, "rb"
W1BDI, F. E. Handy, "fh"
W1CBD, C. B. de Soto, "de"
W1DF, George Grammer, "gg"
W1EH, K. B. Warner, "ken"
W1ES, A. A. Hebert, "ah"
W1GS, F. C. Beekley, "beek"
W1INF, A.R.R.L. Headquarters Operators Club
W1JEQ, Vernon Chambers, "vc"

WIJFN, A. L. Budlong, "bud"
WIJFN, Joseph A. Moskey, "joe"
WIJPE, Byron Goodman, "by"
WIJTD. Hal Bubb, "hal"

W1LVQ, L. John Huntoon, "jh" W1MEC, W. J. Fricke, Jr., "bill" W1MFA, Harold K. Isham, "hi" W1SZ, C. C. Rodimon, "rod"

W1SZ, C. C. Rodimon, "rod" W1TS, Don Mix, "don" W1UE, E. L. Battey, "ev" W3AMR, George Hart, "geo"

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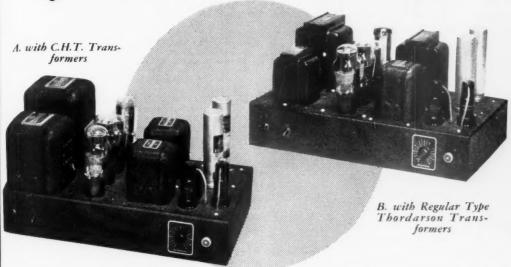
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NEW MODULATOR TUBES WILL NOT OBSOLETE This SPEECH AMPLIFIER!



Today, with THORDARSON parts and THORDARSON complete instructions, you can easily build the most efficient and versatile speech amplifier ever offered to amateurs. Note some of its outstanding features:

You may have your choice of three circuits: (1) the popular over-modulation control circuit, which not only eliminates over-modulation but also increases the average side band power of the transmitter. Or, (2) a peak limiting amplifier, with a self-contained circuit which, with an easy adjustment, makes over-modulation and resultant distortion absolutely impossible. Or, (3) a conventional type amplifier, with circuit and full assembly directions on the regular instruction sheet.

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Place the equipment on the operating table, with screen cover and a 500 ohm line to the modulator, or mount it with a panel

in one rack, as you prefer. This flexibility also extends to a choice of transformers. For you may have either the C.H.T., or regular THORDARSON transformers. Driver transformers with variable ratios are also available in either of these lines.

Complete drawings, photos, parts lists and instructions for easy assembly of these circuits

are offered.

Ask your Parts Jobber or write us for THORDARSON Bulletin SD 389D

Use the Amateur Speech Amplifier with the NEW RCA 811's! Or with any tubes-old, new or as yet undeveloped. New tube types will not obsolete this amplifier!

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SINCE 1808"

YEARLY BINDERS



Are We Right?

You should have at least two of them—one for your complete 1939 file of copies, and one for each 1940 issue as published.

With each Binder is furnished a sheet of gold and black gummed labels for years 1922 through 1941. The proper one can be cut from the sheet and pasted in the space provided for it on the back of the binder.

Price \$1.50 postpaid

Available only in United States and Possessions

THE AMERICAN RADIO RELAY LEAGUE
West Hartford, Conn.

On the Ultra-Highs

(Continued from page 39)

INTERNATIONAL NOTES:

that, with characteristic British fortitude, our cousins of the Empire are attempting to carry on in the amateur spirit, despite the surrender of their licences and transmitting gear to the "P.M.G." Considerable u.h.f. interest is apparent, with six pages in the September issue devoted to the story of the annual 56-Mc. Field Day. We note that all but two of the stations participating used c.c. rigs, although this type of equipment is not mandatory in England. In their extensive use of c.w. the G's set us a good example.

While interest in u.h.f. receiver work will undoubtedly lag, due to the lack of any signals on these frequencies, it strikes us that if any good can come from the current state of affairs in Europe (from an amateur standpoint) it will be the result of the concentration of effort in work on receivers and antennas on the part of those amateurs who are not called to their country's service. With the most likely season for long-haul DX on 56 Mc. coming up, it is not too much to hope that some of those lonely listeners may hear a sig or two from this side of the Atlantic. We are assured of the coöperation of the ZS stations who, though now silent, are still interested in the possibility of trans-oceanic DX on "5." The ZS-W tests instigated by W3HOH are still being carried on, with the promise of a cablegram from the other U. S. A. if anything is heard.

A new inter-G record was set on August 20th by G2OD and G8KD, distance covered being 187 miles. Several Q8O's with I1ZU are reported which sounds like real DX, though it is actually similar to that commonly covered during sporadic E sessions in this country. For the benefit of W9ZJB we report that his "Grand Slam" is credited to "W9XJB" in the T & R Bulletin. Vince, who was "W8ZJB" in Radio and "W9ZJB" in Q8T is, no doubt, about ready to start himself a magazine!

W6OVK sends along a letter from VK2IQ, who expresses regret at being forced off the air by war conditions. He reports that many stations were active around Sydney, mostly with superhet receivers and c.c. rigs.

112 MC.:

T 18 obvious from the reports received that much excellent pioneering is being done on 2½ in all sections of the country, but, due to the lack of important facts about individual setups, we find it difficult to record the complete story of the progress being made. Let's hear more about the rigs and antennas used, the distances covered, frequencies and operating schedules, and other points of general interest. This department is for the benefit of the "ultra-ultra-high" enthusiasts, just as much as for those on 56 Mc.

A fine example of a type of work which tends to earn a high place in the estimation of the general public for amateur radio is set forth in a letter from W3VQ, secretary of the Ultra-High Frequency Club of Philadelphia. This enterprising group did a fine job for the committee in charge of "Philadelphia's Premier Air Classic," which took place on October 29th, under the sponsorship of a local American Legion post. With 21/2-meter transceivers installed at the pylons and other key points, the U.H.F.C. handled the complex communication problems neatly. Official letters of commendation are proudly displayed, and plans are already underway to do an even better job next year. The U.H.F.C. is to be congratulated on its fine work. A somewhat similar service was performed by the Santa Monica Mike and Key Club, who put 21/2 to work at the National Speedboat Races at Balboa, Calif., according to the report of the Los Angeles SCM.

Some real DX on 2½ is reported by W2KYT. He tells of a QSO between W2DAR, West Orange, N. J., and W1BZ, Atlantic. Mass., a distance of nearly 200 miles, but here, again, details are lacking. 2KYT uses two r.f. stages (956's) ahead of a 955-6J5-6F6 lineup in the receiver. The rig is a pair of HK-24's at 100 watts. W2JND, Syosset, N. Y., is on nightly 9 to 11 on 114 Mc. looking for W1 DX. W2BZB keeps an eye peeled for DX every Sunday between 9 and 11 p.m. W2MES/2 worked several stations in the contest with one watt on 2½! W2HGU has HK-54's c.c. and is working up to W1AVV quite well, according to W2AMJ. Some superhets, mostly of the r.c. type, are in evidence.

(Continued on next left-hand page)

BLILEY CRYSTAL UNITS

SHLEY ELECTRIC CO. SERIOL CO. SER

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TYPE SOC 100 Standard Frequency Unit. \$15.50



TYPE B5 40 Meters. \$4.80



TYPE LD2 80-160 Meters. \$4.80



TYPE HF9 10-20 Meters. \$5.75

TODAY, more than ever before, amateurs are discriminating in their demands for quality, performance and dependability in radio components. This is as it should be. The cost of even the most simple transmitter is by no means inappreciable — yet money spent for equipment which is not up to latest engineering and manufacturing standards or which is not thoroughly reliable is an unprofitable investment.

Bliley Crystal Units are not necessarily the cheapest in terms of dollars and cents. They are sold, however, at the lowest prices consistent with high quality, thorough engineering, and maintenance of rigid standards throughout every step in production. They are backed by a reputable organization whose aim is to serve the amateur in the best possible manner. In any product, these factors mean best investment for the amateur.

Illustrated on this page are representative types of Bliley precision-made crystal units for amateur applications. For a full description of the complete line ask your Bliley distributor for a copy of circular A-7.

BLILEY ELECTRIC CO. Erie, Pa.



TYPE BC3 40-80-160 Meters, \$3,35



TYPE VF1 40-80 Meters, \$6.60



TYPE SMC100 100-1,000 Kc. Calibrator Unit, \$7.75



Filter Unit. \$5.50

ACCURATE · DEPENDABLE

ANTENNA BOOK?

• In Chapter 1 we find this or that type of antenna is better than another due to the nature of radio waves and the way in which they travel . . . Chapter 2 is devoted to an explanation of how the strength of the field radiated from a section of wire carrying radio-frequency current depends upon the length of the wire and the value of the current flowing in it Chapter 3 clearly explains how the earth acting as a reflector affects the performance of an antenna, particularly with respect to its directive properties and how we must take this into consideration in its design . . . Figures, design and best methods of adjustment for feed systems to transport power from the transmitter to the antenna with a minimum of loss, will be found in Chapter 4 . . . In Chapter 5 radiation patterns and feeding systems for our old standby the half-wave antenna are given . . . If interested in long single wire antennas, in Chapter 6 we find all the necessary charts and tables to design one best suited for our needs . . . Chapter ? gives us the data for the antenna that we can operate on several bands . . . Driven arrays and phase systems, their adjust-ment, with charts for directivity are fully covered in Chapter 8 . . . Our next Chap ter, 9, is devoted to parasitic arrays and the necessary dope for the design and adjustment of two-element to four-element beam antennas . . . As in the other chapters, all the necessary charts and tables are given in *Chapter 10* for the design of the long wire "V" antenna... The rhombic, or diamond, antenna is so adequately covered in Chapter 11 that one may gain a thorough understanding as well as the practical information necessary to have such an arrangement . . . The problem of finding space for an antenna for 160 meters is minimized in Chapter 12 by giving methods for putting up such an antenna in limited space . . . It having been found that directive systems will extend the operating range on 56 Mc. to a remarkable degree, such antenna systems are described in complete detail in Chapter 13 ... Chapter 14 is devoted to special antenna systems. Flat lines for two bands, three feeder antennas, transmitting loops, dummy antennas, etc. . . . To efficiently utilize our directive arrays we need to be able to determine directions and also true north from our own location. Both of these problems are adequately covered in Chapter 15 . . . Suggestions and details on the construction and support of the antenna and feeder systems will be found in *Chapter 16...Chapter 17* gives us proven methods of supporting and rotating beam antennas, as well as information on drive mechanisms, feeding and determining the direction that the signal is aimed . . . We find in Chapter 18 special antennas for receiving, as well as methods for using our transmitting antenna for this purpose.

50 cents, postpaid. (No stamps, please)

A.R.R.L.
WEST HARTFORD, CONNECTICUT

W3FX, Philadelphia, reports W3's EX, GNA, FAA, ARG, GOM, FSM, FWL, AUY, GFZ, and IHI worked recently, with GGH, DJ, and EMJ also heard. To get on 2½, W3FX added an RK-34 push-push doubler with a series-tuned plate circuit to his regular 56-Mc. final. The antenna is an extended double Zepp. For receiving, a converter feeding an SW-3 does a good job on the more stable sigs, but a super-regen is necessary for most. Fisher would like to hear some c.w. from some c.c. stations.

The recent contest saw plenty doing in California on 2½, with the following W6's reported: LQM, RVL, KWH, QUF, NJJ, OJB, OMC, PRQ, NGQ, and PDW. W60MC plans to take his mobile rig (HK-24 with concentric grid line) to some of the peaks around Oakland on Sundaya. Murdock uses a Kraus multi-wire doublet and finds this antenna easy to get going and far superior to a simple half wave. 6MQM reports two hidden-station hunts sponsored by the Valley Radio Society. A message from 6RVL tells of "... over sixty rigs here on 112 Mc." With all this going on, there should be plenty of interesting dope for the column. What say, gang?

W7HBL, Seattle, reports "The Rover Boys of 2.5," W7's GXP, BDW, GUL, and HBL, working each other, with no out-of-town DX as yet.

Around Chicago W9's LRT, DLP, DYV, UTS, OBW, KUV, SHM, and EDG are going strong, with more coming along. Things are picking up around Milwaukee, according to W9ZGD, who asks us to sponsor the adoption of horizontal antennas. Sorry, OM, but we can't agree there, as yet. All available dope and many tests made on both 5 and 2½ show verticals by far the best for extended local work. More along this line soon.

224 MC.:

AROUND Washington, D. C., W3EIS reports W3's FQB, EJB, AWS, GKP, and FPQ fired up on 1¼, mostly using small Gammatrons or W.E. 316-A's. These boys would like to test with DX stations when 56 Mc. is open. They are trying for QSO's with W3GLV, Leesburg, Va., who is reputedly using a c.c. rig on 1¼!

Va., who is reputedly using a c.c. rig on 1½!

W8NOJ is active in Erie, Pa., according to a story in a
Canadian paper, covering 30 to 50 miles with moderate
power. Activity is promised by W5AJG and W6QLZ in
order to make the most of the high multiplier offered for
1½-meter work in the Marathon. Clyde, 6QLZ, already
has his 35T down there, and is riding around with a mobile
receiver to see how far it can be heard.

The Marathon should provide incentive to many to see what can be done on 224 Mc. Ten points for an over-the-back-fence QSO is not to be sneezed at, and, with high-gain beams such a simple matter, some long-haul work may yet materialize on this band.

And a final word to all. We have high hopes that the Marathon will stimulate consistent activity in all sections of the country. If it does, it will provide an unparalleled opportunity for studying u.h.f. conditions of all kinds. What is the connection, if any, between weather conditions and skip DX? How do temperature inversions affect 2½ and 1½? Can there be skip DX on 2½? Some light may be shed on these and many other similar questions if we keep our eyes and ears open in 1940. Let us never forget that one amateur who was intelligently curious, our own Ross Hull, changed our whole conception of u.h.f. wave propagation by careful and complete observation!

Code Practice Oscillator

(Continued from page 61)

original depth of which has been cut down to $2\frac{1}{2}$ inches to provide room for the batteries at the rear of the case. The two switches, the tube socket and the grid condenser are below the base. The rear-view photograph of the cabinet shows the six pairs of 'phone jacks and the monitor keying terminals. Heavy tinned wire ties the jack in parallel. Throughout the entire assembly, parts are well insulated from the case proper.

The reader will wonder about the RC combination shown "boxed-in" on the diagram. These

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THE Series 200 "Super-Pro" is not just another receiver created in the Sales Department first and then signeered to sell at a price. It is the result of years of search and engineering moulded into a single unit signed to satisfy the demands of the critical commications engineer whose only impasse is explained a "due to conditions beyond our control." Amateurs in more and more demanding commercial permance and the new Series 200 "Super-Pro" is the swer to that demand. The economy in owning a Super-Pro" lies in the fact that is is built for years of sper-Pro" than trade in an ordinary receiver every ser." We might add that even trading for a new

receiver every year would still not give him "Super-Pro" performance. Ask your dealer to demonstrate the full-range variable selectivity of the new "Super-Pro" which covers every band width from single signal to nearly 16 kc. for high fidelity. Investigate the adjustable "S" meter, the efficient noise limiter, the variable crystal filter and its many other features and you will agree that it pays to own a "Super-Pro."

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RCP Test Equipment it's a BETTER PERFORMER IF IT'S for the money

Right down this RCP quality line you get more test equipment service for your money. Greater sensitivity, wider ranges, more measurements. These are typical of the PLUS value in all RCP Test Equipment. It is not unusual to find RCP Test Equipment outperforming instruments costing two, and even three times the money. Do you wonder why each day sees more and more RCP Test Instruments taking over the jobs?

Look at this performance

A pocket size multitester, RCP Model 413, with all the features of "big time" professional testers, and none of the expense! Has a sensitivity of 2500 ohms per volt. Five voltmeter ranges of AC-DC-0/10/50/250/1000 /5000. Three range ohmmeter 0/500/100,000/1,000,000.DC Microamps 0/400. DC Milliamps 0/10/100/1000, DC amps 0/10. Output meter same as AC volts. Meter has the same



fine Alnico Magnet as used in ultra-sensitive, topprice meters. Attractive appearance in natural finish wood case. Weight only 25 ounces. Net price.....

Also available in solid walnut piano finish hinged cover case - Model 409P complete with test prongs. Net..... \$14.95

Full details on RCP Multitester Model 413 are contained in new Catalog 121. Send for a copy at once. Get the facts about the features and you'll buy RCP Test Equipment - it costs you less and delivers more. Send today.



CO. INC 88 PARK PLACE. N. Y. C. components are necessary only when crystal phones are used. Usually, the condenser can be a 0.1-ufd. low-voltage job if only one or two sets of 'phones are used. The resistor should be in the neighborhood of 5000 to 10,000 ohms. Both the condenser and the resistor values should be experimented with to assure maximum headphone volumo

In some cases, when using the unit as a keying monitor, there may be some hum modulation of the monitor signal. This happened in our own shack, but we found it far from objectionable as a matter of fact, we liked it. It was surprising to find that a satisfactory signal could be heard from the speaker even when the operator was wearing headphones. And vet, the signal was not too strong with the 'phones off .- And this with only 15 volts on the monitor tube plate.

New Receiving Tubes

(Continued from page 47)

Amplifier - Class A1

and the same of th			
Plate voltage		90	max. volts
Screen voltage		45	max. volts
Plate dissipation		0.2	max. watt
Screen dissipation		0.035	max. watt
Grid voltage		0	min. volts
Typical operation and characteristics:			
Plate voltage	45	90	volts
Screen voltage	45	45	volts
Grid voltage *	0	0	volts
Plate resistance	0.25	0.8	megohm
Transconductance	700	750	micromhos
Transconductance at - 10 volts bias	10	10	micromhos
Plate current	1.9	2	milliamperes
Screen current	0.7	0.65	milliampere

* Referred to negative filament terminal.

Pin Connections

Pin 1 — Filament (—), suppressor Pin 2 — Plate

Pin 3 - Screen

Pin 4 - No connection Pin 5 - Filament (-), suppressor

Pin 6 - Grid

Pin 7 — Filament (+)

A.R.R.L. QSO Party

(Continued from page 59)

ber of different Sections (and continents 3 outside field organization territory) in which at least one member has been worked and exchange effected. A convenient way to keep record of new and different Sections as you work them is to circle and number the name of the Section the first time it is written in your list.

A lot of fun assured. See how many members you can work on this January Saturday-Sunday weekend. And if you work anybody not a member, ask him "Why not?" It's one of the big annual events. See you there.

³ The multiplier is the sum of the number of Sections and continents outside the field organization territory in which at least one A.R.R.L. member is contacted. But a single multiplier times the sum of points gives the score. Example: W6XXX has completed two-way exchanges with 57 different stations located in 31 different A.R.R.L. Sections and Europe and Oceania. His multiplier is 33. Score? 2 × 57 = $114.\ 114 \times 33 = 3762.$

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GAMMATRON Offers a Beam Pentode



Power Output. watts 225 Plate Dissipation. watts 75 Maximum Plate volts 2000 Maximum Plate M. A. 150 Screen. volts 300 Filament. volts 5.0 Filament. Amps. 7.5 TYPE PRICE \$22.00

Gammatron offers the 257 Beam Pentode, a tube of advanced design using Tantalum elements, eliminating insulators and "getter." It offers high voltage and power capabilities, suppressor grid modulation and requires very low driving power, no neutralization and low screen current.

Other Gammatrons of higher power to 5 KW. Write for complete data.





Model 426 . . . Four-inch Square Case

Volume Unit Meters for measurement of sound or noise levels. The dynamic and electrical characteristics are of new design; in accordance with state reference level of 1 Milliwatt. Calibrated for 600 ohm line. Has 0–100% scale. Reads minus 20 V.U. to zero level in black numerals. From zero to plus 3 V.U. in red numerals.

MODEL 1696 . . . Net \$33.00

This Modulation Monitor is usable on all amateur bands...permits compliance with Federal Regulations



WRITE for CATALOG
Section 251, Harmon Drive

THE TRIPLETT ELECTRICAL INSTRUMENT CO.
Blufften, Ohio

Hints and Kinks

(Continued from page 66)

from an old automobile body. The rotor plates can be cut out with a circle cutter if desired. Both stator and rotor plates are also bolted together and filed to final shape in a block. Twelve rotor and ten stator plates are required.

The end-plate tie rods are pieces of \(\frac{1}{4} \)- or \(\frac{5}{16} \)-inch diameter brass rod threaded for about an inch at each end.

The rotor shaft is probably the most difficult piece to work out. It is made from a piece of soft steel shafting, ½-inch in diameter, which must be perfectly true. Any one of several methods may be used in fastening the rotor plates on the shaft. Probably the most simple method is to drill ¼-inch holes in the rotor plates and use a collar ¼-inch or so thick pinned to the shaft at the front end of the assembly. The tail end of the shaft may be threaded for a short distance and the assembly clamped up tight with a nut at the end.

Spacers for the rotor plates may be cut off to correct length from a section of brass pipe of proper diameter.

The stator plates are assembled on lengths of ½-inch diameter brass rods with ½-inch brass spacers which may be obtained from almost any radio supply house. The rods are threaded for a short distance at each end for clamping and mounting nuts. The isolantite mounting bars may be purchased from the National Company. They are the type which are used in the TMA-type condensers.

The bearings and their fitting in each end plate will be important if the condenser is to run smoothly. Bearings may be taken from an old condenser or a panel bearing with a spring washer may be used for the front bearing and the tail end of the shaft drilled slightly to receive a small ball bearing. The rear end plate may then be drilled and tapped for a ½-inch screw, the end of which has also been cupped out to fit the ball. A locknut may be used to hold the tension adjustment.

— Arnold Tangen, W9YNX

Wide Band Frequency Modulation

(Continued from page 19)

pass condenser be laid on the socket in such a manner as to form a shield between grid and plate leads. Although the experimental model has a gain control in the cathode circuit of the i.f. amplifier, this could be discarded in favor of a more useful variable control for adjusting the plate and screen voltage on the limiter, which seems to be more important. It is only necessary that the i.f. amplifier have sufficient gain to work the limiter stage successfully — the limiter takes care of various signal levels over a range of 50 db or more.

Tuning of an f.m. receiver is very similar to that with the ordinary a.m. outfit. With no signal, there is the usual background hiss of a somewhat different character than that from a narrow-band a.m. receiver since more high-frequency com-

(Continued on next left-hand page)

COOPERATION" has long been my motto

HAVE FOUND, from years of experience in the radio business, it always pays dividends to cooperate to the fullest extent with my customers. A satisfied customer is the best advertising obtainable. Accordingly, I keep my customers happy by prompt and fair dealings.

But I cannot give such satisfaction without the cooperation of the manufacturers, so I maintain an unusually close contact with my suppliers. In this way I am able to keep my customers informed of the newest and best apparatus available as it is being developed.

For example, since coöperation has been so very close with the RME Company I am ready at all times to supply you with complete information on their Receivers and Expanders.

RME's DM-36 Band Expander is one of the finest pieces of five meter equipment I have ever seen. Enthusiastic users of it report "5" wide open for DX.

And the RME-70, pictured below, is one of the better communication instruments which I gladly recommend as an outstanding example of craftsmanship.

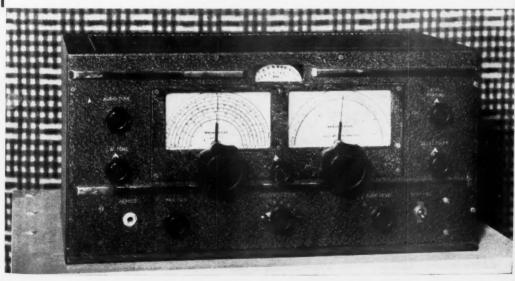


DM-36

Whatever you need in the RME line I have it for you. You can order on my personally financed 6% installment plan. You can trade in your receiver. Prompt shipment from Butler, Mo., in factory sealed carton or shipment direct from RME factory.

I have a complete stock of all receivers, transmitters, parts. I guarantee you can't buy for less or on better terms elsewhere. Your inquiries and orders invited. Bot Henry

HENRY RADIO SHOP MISSOUR



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"Smooth Performance" Electro-Voice MICROPHONES



The New No. 630 DYNAMIC

★ FREQUENCY RESPONSE: 40-9000 c.p.s. with rising characteristic on upper end of curve.

- ★ OUTPUT: -56 DB, (open line). Standard output impedances include Hi-Z, direct-to-grid.
- ★ VOICE COIL: Hard drawn aluminum wire for lightness, insulated with Polystyrene.
- ★ MAGNETIC CIRCUIT: Large Alnico magnet with Armco magnetic iron pole pieces.
- ★ DIAPHRAGM: Heat treated Durev.
- ★ TRANSFORMER: Built-in in all models except 50 ohm. Core material has extremely high permeability.

Tiltable for directional or non-directional pick-up Rugged construction. Impervious to heat, temperature changes, rough handling and salt air. Chromium and light gunmetal finishes. Three-contact locking connector, 20 ft. low capacity cable, on-off switch and tilting stand mounting.

630-GM (gunmetal) net price......\$15.00 630-C (chromium) net price....... 16.50

Model "75" CARBON

New streamline styling. 5%"—27 stand coupling. Button current (each) 3–5 m.a. for close talking or feedback reduction. 10–15 m.a. for normal work. Finished in gunmetal.

Net Price......\$4.50





Model "V-1" VELOCITY

Small in size, flexible in operation. Frequency response from 40–10,000 c.p.s., substantially flat. Output: -65 DB. 20' cable, connectors, shock-absorber, locking cradle and on-and-off switch.

Net Price......\$15.00

ELECTRO-VOICE MFG. CO., Inc.

1239 SOUTH BEND AVENUE SOUTH BEND, INDIANA

Export Division: 100 Varick Street, New York, U. S. A. Cables: "ARLAB"

ponents are present. Ignition noise and other impulse-type noise from man-made sources will be very low in amplitude, however, because of the limiter action. When a carrier somewhat stronger than the background is tuned in exactly at resonance the hiss changes considerably in character. now being composed chiefly of high-frequency components, the lower frequency noise being highly attenuated. It is advantageous to use some form of tone control to reduce high-frequency hiss outside the audio band of the transmissions. When the carrier is a few times as strong as the background the hiss entirely disappears, and only such frequency modulation as may be present on the transmitted signal or may be introduced by the h.f. oscillator in the receiver is heard. Strong man-made noises will be heard only as a quite weak background accompaniment of the signal. On very weak signals, the hiss behaves much in the same way as with an amplitudemodulated signal, but the improvement in reduction of man-made QRN still holds.

If they are not too strong, amplitude-modulated signals can be received on the f.m. receiver by detuning them slightly. In this position, a sort of hybrid detection takes place that allows the signals to be copied. It would be advantageous here to have a variable control on the limiter, so that the limiting action could be reduced when amplitude-modulated signals were being received. A still better method of receiving a.m. signals would be to switch the grid circuit of the first audio tube to the hot end of the limiter grid resistor, the limiter then becoming an ordinary diode rectifier for amplitude modulation.

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On the other hand, the experimental f.m. receiver looks like the best receiver we've ever seen for 112-Mc. self-excited signals. Since any modulated oscillator in the u.h.f. range has as much (if not more) frequency modulation as it does amplitude modulation, the receiver does a beautiful job on receiving transceivers and the like. One thing that immediately becomes apparent is that less modulation is required on the transceiver when using the f.m. receiver to receive the signal than if a regular superregenerative receiver is used. The quality seems to be better, too, probably because the modulator is not being forced when f.m. is used.

Frequency-modulation should have a definite place in amateur u.h.f. communication. It has demonstrated some highly useful characteristics for our purposes. What is needed now is to get a number of stations on the air using it, to give us definite comparisons of the relative merits of f.m. and a.m. and, as well, the shortcomings of both. Our u.h.f. bands certainly will accommodate both systems at the present time and probably for a long time to come. There are, of course, problems to be solved in the practical use of frequency-modulation — as an instance, a simple form of deviation indicator is needed so that transmitter performance can be predetermined to meet the requirements of receivers of various band-widths. We have opened to us a really new field in technique, highly interesting in itself and extremely promising in performance.

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FOUR NEW MEISSNER INSTRUMENTS



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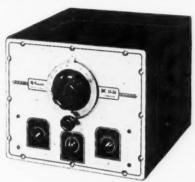
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Deluxe Signal Shifter Variable Frequency Exciter Unit

The new DeLuxe model Signal Shifter is particularly designed for both CW and Phone operation. Two voltage regulator tubes and high-C temperature compensated oscillator circuit provide stability comparable only to crystal control. New precision dial with full coverage on any selected band. Built-in keying filter assures clean-cut keying action. Completely assembled, wired and laboratory adjusted, ready for use (except for tubes) when you buy it. \$44.95 Net.



MC 28-56

5 and 10 Meter Converter Unit

A voltage regulated, stabilized frequency Converter unit designed to extend the frequency range of existing receivers to include the popular high frequency bands of 5 and 10 meters and to improve performance of receivers which may have 5 and 10 meter coverage. Three tuned circuits, with tubes having very favorable noise suppression characteristics, are employed to provide high gain output. Tuning is controlled by a precision type dial with auxiliary vernier compensator. Stability and drift-free operation assured by voltage regulated power supply and special high-C oscillator circuit. Unique antenna selector switch permits selection of antenna best suited to conditions and frequency. Completely assembled, wired and laboratory adjusted. \$41.25 Net less tubes.

PASTE ON 1c POSTCARD MEISSNER MANUFACTURING CO., Mt, Carmel, III. Dept. Q-1 Rush data explaining how the Meissner "Big 4" will improve results for me. Also your 1939-1940 Catalog Name Street

City State



Signal Booster

High Gain Preselector

The Signal Booster provides high-gain preselection with complete coverage from 1,600 to 31,000 KC. The average gain of 40 Db. gives weak signals a tremendous boost . . . signals which quite often are inaudible on the receiver alone. A front panel control permits adjustment for maximum signal-to-noise ratio with either standard or doublet type antenna. Designed to match standard receiver impedances. A fip of the antenna change-over switch proves the high gain action of this outstanding communications product. Uses two 1852's and a 5Y4G rectifier. Completely assembled, wired and adjusted for peak performance. Your jobber will supply it, less tubes, for \$38.25 Net.



Signal Calibrator

Precision Type Frequency Standard

This precision built instrument belongs in every Amateur station. Enables the operator to comply with government regulations and keep a constant accurate check on transmitter frequency. Makes use of a special silver-plated quartz crystal having very low temperature coefficient and adjustable to exact fundamental frequency of 100 KC. Multivibrators operate at 50 KC. and 10 KC. enabling the operator to identify all Amateur band edges including phone bands. Strong signal output up to 60 MC. Furnishes either unmodulated or modulated signal output, adjustable over wide range. Retains calibration over long periods of time. Complete with tubes and ready to use... \$39.90 Net.



Not necessary with the PRECISION Series 844-34 Range AC-DC

VOLT — OHM — DECIBEL — MILLIAMMETER

Ready for instant action. PRECISION test equipment is most popular with progressive amateur operators.

PROVIDES complete facilities for obtaining all measurement requirements for Amateur, Service, Laboratory, Television and Industrial use.

- Large 45%" Precision square type meter; D'Arsonval type; "bridge type" construction; 400 microamtype; "bridge type" cons peres full scale sensitivity.
- Precision wire wound shunts and matched molded metallized multipliers of an accuracy within 1%.
- Individually calibrated and scaled against laboratory standards assuring 2% DC and 3% AC overall accuracy.

SPECIFICATIONS

- ★ SIX A.C. and D.C. VOLTAGE RANGES at 1000 ohms per volt: 0-12; 0-60; 0-300; 0-600; 0-1200; 0-000 volts.
- ★SIN D.C. CURRENT RANGES: 0-1.2; 0-12; 0-60; 0-300; 0-1200 MA; and 0-12 Amperes.
- * FOUR RESISTANCE RANGES: 0-400; 0-100,000; 0-1 Meg.; and 0-10 Megs.

 * Provisions for Mounting Ohnmeter Batteries (41/2) and 45 volts) on inside of case.
- ★ SIX DECIBEL RANGES from -12 to 70 DB.
- ★ SIX OUTPUT RANGES: 0-12; 0-60; 0-300; 0-600; 0-1200; 0-6000 volts.

844-L — Housed in walnut finished hardwood case with carrying handle. Compact in size (7 x 8 x 4). Less batteries and test leads. Net ... \$22.95

844-P - Closed type with removable cover and \$24.95 tool compartment.



PRECISION APPARATUS COMPANY 647 Kent Avenue Brooklyn, New York

Export Division: 458 Broadway, New York City, U. S. A. Cable Address: Morhanex

Correspondence Department

(Continued from page 67)

THE ANSWER

15 Lea St., Lawrence, Mass.

Editor, QST:

In answer to W5EGV in the November '39 issue of QST he asked about armatures that had got soaked. . Well, here's the answer.

Place armature in oven at 180 degrees and hold to that temperature. If armature has been under water it will take 48 hours or more, depending on size. If windings are just wet from dampness or a little water, usually 24 hours is sufficient. If it is possible to obtain a "Megger" one can get positive readings. When reading is infinity, your armature is completely baked and all ready to go again.

During our last flood, all our motors and generators were completely covered with water for three days. . . . That was the method used, and we did not lose a single motor or generator, big or small. . . .

- Paul Wm. Muller, WIHXE

OFF THE AIR

5, Pollards Hill S., Norbury, London, S. W. 16 Editor, QST:

Popular opinion amongst hams your side of the duck-pond pictures the average English ham a couple of hundred feet underground, flooding his air raid shelter with tears of despair at being off the air. Well, we may be off the ether. but we're certainly not under it. So here's some dope on things over here.

As soon as the show started over here, the government sent out notices ordering us to shut up or down, whichever you prefer. Some of us did.

So to make dead certain inspectors were sent to our shacks to put our rigs off the air. This consisted of confiscating coils and crystals and in my own case one or two connections were opened. I was away at the time and returned to find that the r.f. chokes in my modulator, and the socket for the HK354 final had been disconnected. Since neither were actually in operation and I still had the exciter unit and a 100-watt sub-amplifier running, I didn't know whether to shoot myself or to give myself up at the nearest jail. The problem was solved by the arrival of two more inspectors who announced their intention of removing the entire rig. The main H.T. transformer weighs 150 pounds, then there is a 350-watt modulator complete with power supply, plus a couple of other power supplies for the sub-amplifiers, all bolted firmly to a fairly weighty W.E. rack. The time being ten ack emma Sunday morning, I suggested they join me at bacon and eggs and thought matters over. In the words of Napoleon (or was it Alexander the Great?) they came, they saw, and they had breakfast. An SOS was sent out to local hams, and with their aid the rig was eventually removed. .

And so we're off the air, but we're still carrying on. We've still got our receivers to work on, and many of the gang are doing some really good work on u.h.f. supers, so your crowd had better look to your laurels or we'll have you licked in that field.

EA!

Write

100-P

MAI

PRO!

The South London-Croydon hams are still sticking together. Some of us have been called up, some are away, but those left are still keeping the ball rolling. After all we can imagine just as much DX to brag about without rigs as we could when we had them. It's a pity we're not allowed dummy aerial operation, but we're not, so it's no good grousing. The consoling thought is that when war is over there will be tons of ex-government gear to be picked up for next to nothing, so look out for your ears when we do come on again. I don't know if the rest of the Empire is off the air, but I've heard ZS and ZL so apparently they're still allowed, unless they're pirating.

We're still keeping our local club on the map. . . . The R.S.G.B. Bulletin is still running, but commercial radio mags are feeling the pinch and are publishing small monthly editions at three times the price of their old weekly ones. I have seen QST for October, but don't know if I'll see any more - it's very hard to get dollars owing to the exchange restrictions, and I doubt whether magazine importers will be able to get us copies either for the same reason.

(Continued on next left-hand page)



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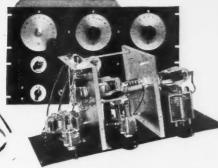
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BROWNING 10-160 METER BAND SWITCHING EXCITER KIT

PHONE OUTPUT-25 WATTS An electron coupled exciter using band switch tuners for plate and grid circuit. Permits operation on any band from 10 to 100 meters. No plug-in coils are used, and bands are changed by switches and convenient tuning controls. Frequency stability is comparable to a crystal oscillator, and the calibration is permanently reliable. The high quality of components by leading manufacturers, combined with the extreme flexibility of design makes the Browning exciter a very efficient instrument.

Including Amphenol sockets, Cardwell variable condensers, Cornell-Dubilier capacitors, and Ohmite resistors. Net Price.

Kit of Raytheon tubes: 1-RK25, 1-RK39, and 1-615G.

Net Price. \$9.24 \$7.91

THE POWER SUPPLY A well regulated, well filtered power supply kit that will supply the exciter as well as the modulator. Net price for complete kit of parts, less tubes...... \$28.93 Kit of four Raytheon tubes

SPEECH AMPLIFIER AND MODULATOR
A 30 watt push-pull phase inverter 61.6 audio amplifier kit that will modulate the Browning exciter kit 100 per cent. Complete kit of parts, less tubes.

Net Price. \$12.73

UTC CATHODE MODULATION TRANSFORMERS



UP TO 200 WATTS RF INPUT

Type CM-15 cathode modulation transformer, tapped secondary 300 to 2,000 ohms. Will handle 15 watts audio. Net Price... \$2.35

UP TO 500 WATTS RF INPUT

Type CM-16 cathode modulation transformer with variable tapped secondary 300 to 2,000 ohms, audio power 35 watts. Net Price...... \$3.23

UP TO 1 KW RF INPUT

Type CM-17 cathode modulation transformer, tapped secondary impedance 300 to 2,000 ohms, for modulating 1 KW plus RF input. This transformer handles 100 watts audio power. \$7.06

A BETTER SKY CHAMPION



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It has all the fine features of the former model plus these quality additions: 1 Additional Stage of I.F. (2 I.F. Stages in all); 1 Additional Tube (making 9 tubes in all); Dickert Automatic Noise Limiter; Separate Electrical Band Spread - Inertia Controlled; Drift-Compensated High Frequency Oscillator; 3 Watts output; Both Dials Illu-

LIBERAL TIME PAYMENT PLAN

Model Down Payment Per Month for 6 Months S-20 R \$9.50 \$7.33

RADIO SHACK ST., BOSTON, MASS., U.S.A



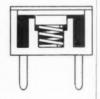
Monitor now offers you the new "Type E" Crystal unit at the extremely low price of \$3.25! Here, for the first time, is a factory mounted, factory tested and factory guaranteed crystal at a cost well within the reach of everyone!

"Type E" Crystals are of oriented cut, operating within the following bands: 160 Meter (Type E-16), 80 Meter (Type E-8) and 40 Meter (Type E-4). They are available in frequencies within .2% of specification, or choice from dealer's stock. Every "Type E" Crystal is mounted in the Monitor Standard Amateur Mounting, ready for installation. You get the benefits of a complete crystal unit, mounted at the factory, at a price comparable to an unmounted crystal and holder.

Get the assurance of a laboratory tested and guaranteed crystal, correctly mounted for dependable operation—specify Monitor "Type E" on your next installation!

MONITOR STANDARD AMATEUR MOUNTING

The cutaway view shows the Monitor Standard Amateur Mounting, used on all "Type E" units. Notice how pressure is regulated and maintained...how the crystal is completely protected from mechanical shocks...and how the large contact area against the top plate allows better heat radiation. Specially de-



signed monel electrodes provide mechanical ruggedness for mobile operation and black bakelite body construction assures low losses. Remember:—regardless of type or price, Monitor gives you these and many other quality features in every crystal unit you buy—features that guarantee you quality higher than the pricel

Monitor welcomes inquiries concerning crystal problems. When writing, please give full information on circuit design. There's no obligation, of course!



Maybe you'd like to know how we are getting on with the present bother running. (If you don't, then skip the rest of this letter.) I can only speak for London as I work in that burg. As a precaution we had sent most of our staff about 150 miles away around August 25th, and just a few of us were left to run things at my office. Ten-thirty on the Friday morning after, news came through of the invasion of Poland. Some said London would be bombed that very day, others said ridiculous, and offered to lay bets against it. But we were really too busy to worry, so after about ten minutes the thing was almost forgotten, and we more or less returned to normal. As I was working pretty late at my office I was staying at an hotel, and as I left my office about ten that night, and was crossing by the Bank of England, all the street lights suddenly went out. That was the last we've seen of them.

Tuesday, September 5th, we had an air-raid warning. I had given my hotel orders to call me at 7:15 that morning, but at 6:45 I was awakened by the air-raid sirens going off. They're rather reminiscent of your police car ones. I slung some clothes on and joined the rest of the visitors in the lounge where we all parked on settees and went to sleep. About 8:30 we got fed up, so a number of us trotted out into the Strand to have a looksee, but there was just nothing doing. Then we heard that the hotel had shut down their boilers in case of trouble, so we all bolted to the bath to grab what little hot water remained. I had just lathered my face when the "All Clear" went. And that was supposed to be an air raid.

Our two moans are about the blackout and the petrol restrictions. After dark no lights whatsoever may be shown from houses; from the outside they must appear unoccupied, and all street lights are extinguished. So once home at night you stay home. To walk out after dark means to fumble along in Stygian blackness the while you bark your shins on sandbags or bash your nose against lamp-posts. Traveling home at night to the suburbs is particularly unpleasant—not enough light to read by, so being English we just sit and glare at our neighbors without uttering a word.

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We are allowed enough petrol for 150 miles a month, which makes running costs per mile so high that most of us have laid up our cars for the duration. Still even if we didn't, it's not exactly fun driving in pitch dark streets with just about as much light allowed on the car as a parking light gives, so it really doesn't matter.

Cinemas and theaters are open till ten, so here in London we have plenty of amusement. Life is more or less normal save for the blackout and the fewer private cars on the roads. I still have my bacon and eggs for breakfast, my coffee at eleven, my steak and pint of beer at one, my tea at four, and my dinner when I get home, so what the hell? For centuries the City of London has always stopped for its morning coffee and its afternoon tea, and it's certainly not going to give up ancient habits now — we're far too conservative.

Well, I think that's just about all, except that although I can't talk to you lads over the air, I'd appreciate hearing from you once in awhile.

Keep on the air, U.S.A. We like hearing you.

— Basil Wardman, ex-G5GQ

INANE BABBLING

Delta Sigma Phi House, Michigan State College, East Lansing, Mich.

After a few hours of studying last night, I pushed switches and planned on spending an hour or two QSO'ing before going upstairs to bed. The rig was on "80 meter c.w." and, after a short three-way with a couple of fellows in Brooklyn, I swung the receiver up onto the 'phone band to see if I might stand a chance for a contact on 'phone. Well, I didn't get around to moving the transmitter to the 'phone band, but I did get my ears full of "Let Me Call You Sweetheart," "Girl of My Dreams," "Sweet Adeline," and at least a half dozen more such songs emanating from an "unidentified" station (Heaven forbid their signing a call!) on approximate

ly 3940 kilocycles. . . . Most of us like to go out and have a good time, and most of us have, at one time or another, violated a "reg" or two. But any person with the intelligence of a seven-year-old child should know that everything has its own time and place. After a ham has taken that extra drink the place for him is, but definitely, any place but in his shack! No one who

(Continued on page 102)

Station Operating Supplies

Designed by A.R.R.L. Communications Department

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THE
LOG
BOOK

As can be seen in the illustration, the log page provides space for all facts pertaining to transmission and reception, and is equally as useful for portable or mobile operation as it is for fixed. The 38 log pages with an equal number of blank pages for notes, six pages of general log information (prefixes, etc.) and a sheet of graph paper are spiral bound, permitting the book to be folded back flat at any page, requiring only the page size of $8\frac{1}{2}$ x 11 on the operating table. In addition, a number sheet for traffic handlers is included with each book. The LOG BOOK sells for 35c per book or 3 books for \$1.

OFFICIAL RADIOGRAM PADS

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and e for who The radiogram blank is now an entirely new form, designed by the Communications Department to comply with the new order of transmission. All blocks for fill-in are properly spaced for use in typewriter. It has a strikingly new heading that you will like. Radiogram blanks, $8\frac{1}{2} \times 7\frac{1}{4}$, lithographed in green ink, and padded 100 blanks to the pad, are now priced at 25c per pad, postpaid.



and MESSAGE DELIVERY CARDS

Radiogram delivery cards embody the same design as the radiogram blank and are



available in two forms — on stamped government postcard, 2c each; unstamped, 1c each.

AMERICAN RADIO RELAY LEAGUE, Inc.

West Hartford, Connecticut

Station Activities

ATLANTIC DIVISION

FASTERN PENNA. — SCM, Jerry Mathis, W3BES — AGV made W.A.S. in 22 hours in the SS. 3AOC, still in the hospital, is fixing B.C.L. sets for the staff. Enquire of 3AON for information on the "Pa. Net if you are an A R R L member 3RES borrowed enough "junk" to get in the SS. BRZ and 3FJU enjoyed the Oct. O.P.S. party. week-end of the SS, but listened and logged 450 stations in 41/2 hours, 3FPC is preparing for future O.P.S. parties by building up to 1/2 kw. 3GDI took 12 messages during the O.R.S. party. 3GET has a new "getting out" antenna. 3GHM says he is out for blood in the next O.R.S. party. 3GKO hopes the B.C.L.'s will leave his new antenna alone. 3GYY heard all districts except the first on 3.5 Mc. in one half hour, 3CDY has given up 1.75-Mc, 'phone and is on 3.5 Mc. 3HOV is organizing a 1.75-Mc. 'Phone Emergency Net for Lebanon, 3HXA has his W.A.C. ticket, 3HZK had a swell time in the SS with 32 watts. 3IGK made the astounding number of 35 contacts in one hour in the SS. 3KJ received a QSL from EK1AF, worked on 'phone. 3RR lauds his e.c.o. for its performance in the SS, 3QV was confined to the Naval Hospital for quite a siege, following an operation; he was not without his faithful HRO which gave him the W1AW broadcasts and the N.C.R. on 3610 kc. 8ASW is a P.N.G. operator for the Hq. troop. 8ATF is reorganizing in new QTH. 8RHE will be on from Lancaster, where he is now employed. Here are a few round number SS scores: AGV 57,000, DMQ 46,000, BES 97,000, FLH 55,000, HXA 33,000, GYV 27,000, FRY 63,000, BXE 36,000, GHD 46,000, KT 41,000, GET 42,000, GHM 67,000, GJY 53,000, GRF 60,000

Traffic: **W3**ADE 76 3AGV 2 3AKB 304 (WLQP 30) 3AQN 173 3BES-3DXC 7 3EML 1063 3FIU 2 3GDI 56 3GET 15 3GHM 7 3GKO 353 3GYK 55 3HCT 36 3HXA 5 3HYD 30 3HZK 68 3IGK 5 3RR 21 8ASW 369 8ATF 18 8FLA (WLQA 104 Sept.-Nov.) 8EU 3 8HKS 11 8OML 8

8RHE 17 8SNZ 8.

MARYLAND-DELAWARE-DISTRICT OF COLUM-BIA—SCM, H. E. Hobbs, W3CIZ—BHE's O.B.S. schedule: 8:30 p.m. Mon.; Code practice: 8 p.m. Mon. 2ELK visited BHE. HUM has new e.c.o. which works FB. HQU worked Utah for W.A.S. GYQ reports T40's in final with an e.c.o. ICT's A.A.R.S. schedule is working FB. GXU reports a Jr. opr. EZK's O.B.S. schedule: 1844 kc., Mon. and Thurs., 7 p.m. The S.C.M. sends greetings to all, and would like to have station activities reports from each and every one in the Md.-Del.-D.C. Section. This will help make an interesting paragraph in QST for us all. BAK has returned from Calif.

Traffic: W3BWT 633 CXL 484 (WLM 3684) BKZ 194

ICT 73 CIZ 582 GYQ 46 HQU 35 HUM 146.

SOUTHERN NEW JERSEY - SCM, Lester H. Allen, W3CCO - Ass't SCM, Ed G. Raser, W3ZI - R.M.'s: 3BYR, 3BEI, 3ZI - P.A.M.: 3GNU. We welcome VE and CCC to the O.R.S. official ranks. The following stations have reported into the "South Jersey O.R.S. Net" and are considered active O.R.S.: AEJ, AVJ, BEI, BYR, BZX, DNU, EFM, GMY, HMR, IHD and ZI. This net meets every Tues., Thurs. and Sat. at 8 P.M., under the guidance of R.M.'s ZI, BYR and BEI. We need a few more active O.R.S. If interested in this work, please contact your S.C.M. at once. It is hoped the Official Phone Net can get started this month. A few more Official Phones are needed so, if at all possible, send in your application or recommendations immediately. According to statistics compiled from the Monthly Report Cards, the South Jersey Section stacks up as follows (Consumption of Operating Time for the year 1938): Traffic 61%, Rag Chewing 31%, DX 6%, Experimenting 2%. DNU reports traffic outlets to Florida. New Orleans and the West Coast through his newly made schedules. FSI sailed for the Canal Zone, Oct. 30th, where he will be employed as an electrician. We sure will miss his loyal work in A.A.R.S. and traffic totals. BZX is pushing the • traffic over Trunk Line "B," which operates on 3795 kc. FNH is rebuilding his rig for 14, 7 and 3.5 Mc. GSR

is back on 7 Mc, with new e.c.o. unit, GFO is now a proud papa of a YL. Congratulations, Elmer, Professor Frank Olden was guest speaker of the South Jersey Radio Assn. Prof. Olden related his experience just prior to war breaking out in Germany. An interesting lecture on First Aid was given at the last meeting of the Delaware Valley Radio Assn. by Mr. J. F. Otis, Dir. of Public Safety of the Public Service Corp. of N. J. This same lecture is available for any club in the State. (In keeping with A.R.R.L.'s slogan, "Switch to Safety," I suggest billing this lecture for one of your future club meetings.) CCO and ZI were guest speakers at the Greater Camden Amateur Radio Assn. IIN is new member of the Trenton Radio Society. HAZ is new member in the Delaware Valley Radio Assn. GTU has rig working FB on 28 Mc, EBA has been working 3.9- and 28-Mc, phone FNR has new and very fine signal on 3.9-Mc. 'phone. EET is trying to round up a little DX on 28-Mc. 'phone. EGE has started a new rig, using a 6L6 and T-40 for 28 and 14 Me. FNL will soon be heard from new OTH. BWF, one of the nioneers of the "85-meter phone" days, has returned to the amateur ranks; Les can be heard on 1.75-Mc. CFS got his rotary working FB on 28 Mc. EUH is chasing New Mexico and Arizona for W.A.S. HDJ has very FB 14-Mc. 'phone. LH is rebuilding complete transmitter. GQX has rotary beam for 28 Mc. BAQ has returned after being absent for 5 years; Ted can be heard nightly on 3.9- and 1.75-Mc. phone. CCO has daily traffic schedule with 9QPK in Kansas. Felicitations and congratulations to BIN on recent marriage. FMR schedules 9CAC or 9AFJ daily at 8 A.M. GMY reports FB time in Oct. O.R.S. party, and gathered 1,600,000 points. OQ has been doing a mighty fine job on Official Broadcast work and also Official Observing, GCU would like to have some verifications on his Official Broadcasting; anyone hearing Ray, drop him a line, EWK's rig is re-conditioned. GSR reports traffic for first time. HSL schedules FBM every Sunday, HMR installed Hetrofil in his present receiver and it works FB. HC, new Mount Holly ham, is putting finishing touches on his rig. GUJ took upon himself one wife. Congratulations, Charlie. IIZ, ex-W2KNQ, is working 28-Mc, 'phone at Morristown, Glad to have you in our Section, DGE is taking a First Aid Course, HWO returned to 1.75-Mc. 'phone, IDP has nice sounding 'phone on 1.75 Mc. HAZ pruned his antenna, and reports working out much better than ever before. EED has new receiver. Fellows, if you have not been mentioned, how about letting us hear from you listing your activities and any traffic totals? Your cooperation will be greatly appreciated. Until next month, 73 to all.

Traffie: **W3**BZX 370 FSI 179 BYR 174 (WLNV 7) ZI 125 DNU 117 EUH 52 FMR 50 GMY 46 OQ 39 0FS 38 GRW 35 VE 32 GNM 31 GCU 28 CCO 24 EWK 19 AEJ 17 HCL 16 CYI 9 GSR 7 HSL-HMR 6 HLV-HKO 5 IHO 4 BAY 2

INII 1

WESTERN NEW YORK - SCM, H. E. Preston, W8CSE — R.M.'s: 8BJO, 8DSS, 8FCG, 8JTT, P.A.M.: 8CGU. E.C.'s: 8GWY, 8RGA, 8RVM, 8SBV. Section O.R.S. Net frequency 3720 kc. The Finger Lakes Transmitting Society held its annual banquet at the Osborne Hotel in Auburn on Nov. 18th, with about 150 hams attending. Among the notables present were "Doc" Woodruff, 8CMP, A.R.R.L. President, Mr. Kratokvil, the new R.I. for this district, and O. W. Hungerford of VP3THE. A fine program, an excellent turkey dinner and a nice assortment of prizes made the occasion a very enjoyable one. The Utica Club is planning on a hamfest early in the new year. The Central New York Radio Club held election of officers, November 16th: DRW, pres.; QGS, sec.; GZP, treas. CP, GAI, JPO and PXA were elected to the Executive Committee. The club meets in room 403 of the Dennison Bldg., 205 East Favette St., Syracuse, every Thursday night, All amateurs cordially invited to drop in and meet the gang. There is considerable activity on 1.75-Mc. c.w. A number of the boys report FB results with low power and poor antennas. The lack of QRM is the major contributing factor. We note with regret the death of Chester Grabowski, W8JXK, of Syracuse. Until illness prevented his activities, he was well known on the 1.8-Mc. 'phone band. The hams along the St. Lawrence River have formed a new club, the Ogdensburg Amateur Radio Club, with AXE, pres.; KYM, vice-pres. and sec.; SUV, treas.; and ETH, activities manager. Here's wishing them all the success in the world. The arrival of a new Junior op kept MVQ off for a while. CZM has been re-issued his old call. SZG is knocking them off on 3.5 and 7 Mc. with only a 6L6 crystal oscillator. LGH has

HKU Noi last m his ele BMR 3.5 Me to new chewin experir along College 7-Mc. organiz has a w local co CAY h 3.9-Me poppa. the exc gavea and eve best w Year. 7

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heen discharged from the Oswego County Sanatorium, but will spend a year at the Soldiers' Home at Tupper Lake. We have 2CIL with us in Oswego, SEB is very active, SEI is out for W.A.S. with 100 watts to new rig. DHB is active again. RVM is doing great work as Emergency Coordinator in northern N. Y. CGU, FFN, IY, GWZ, NNJ, GBY and BGY were at the Auburn Hamfest and had a personal meeting of the "Toothpicker's" Clan. CP was also among those present. UBC is a YL in Cortland, and will probably be on 1.8-Mc. 'phone. TVQ is new Dunkirk ham. TZC in Buffalo will be O.R.S. as soon as he feels he can hold his own in the net. SZK is regular reporter in O.R.S. Net. DHU will he in Albany for the month of Dec. QWA has new low-power phone rig on 1.8 Me. MCF is back on 7 Mc. with a Howard 450A and P.P. 801's. NA is still working on his 28-Mc. rig. PWU is checking up on harmonics and key clicks in his capacity as Official Observer, AOR will take traffic for portheastern part of the Section; his frequency is 3578 kc. ALP, CSE, DSU, IGT, KXN and SED have a little net that meets on 3.9-Mc. 'phone; all are employed by the Bell Telephone Co. ACY gets amazing results on DX with extremely low power, GWY has been reporting into O.R.S. Net. KDY is working portable from Cazenovia, QUN enlisted in Coast Guard and left the Section. This is my last report as S.C.M. of this Section. It has been a pleasure to work with the gang, and I want to extend my thanks for the cooperation shown.

Traffie: **W8**SMI 11 DHU 25 SZK 33 JTT 70 CGU 14 RVM 3 SEI 16 PWU 15 SBV 62 BJO 285 GWY 59 RKM

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WESTERN PENNSYLVANIA — SCM, Kendall Speer, Jr., W80FO, Asst. S.C.M. in charge of Emergency ordination, W8AVY - BSC, new president of Mon Yough Amateurs Transmitters Assn., held a stag hamfest at his home, Nov. 12th. KWA and QAN, although busy with work, manage to run up nice traffic totals. The XYL at NCJ copied the Navy Day message again; the OM was busy with the SS. OKS says UAD is a new amateur at Aspinwall. OEM moved to 2726 Maple Avenue, Altoona. RIT says NWY invested in a T55. QDN has new Howard receiver. ROA is going on 28 Mc. KXP has new "Q" antenna. SWT is on 28 Mc. with new Mims Signal Squirter. RYC is experimenting with various band-switching exciters. RAU completed 8JK beam. RAZ is using HY 25 final. SBQ says 7EWW/8 is keeping his rig warmed up. RNH enlisted in N.C.R. OBK revamped his transmitter for break-in, SFV has worked 55 countries with 75 watts input. The Naval Communication Reserve is open for enlistments. Please drop in at the Armory Headquarters at Pittsburgh, in the Old Federal Bldg., Room 504, any Mon. or Thurs. evening. Lt. B. P. Williams, N8ZD, is the commanding officer. You must have an amateur license

Traffie: **W8**QAN 393 KWA 323 NCJ 207 BHN 68 NDE 64 CMP 63 PX 58 DNX 43 QBK 40 OKS 36 OEM 31 CKO 26 AXD-0FO 13 RIT 12 OUT 11 RAP 6 QEM 3

HKU 1 MOT 144 (Sept.-Nov.: PX 66).

ROANOKE DIVISION

NORTH CAROLINA — SCM, W. J. Wortman, W4CYB Activity has taken a definite upswing during the last month. ECH takes the lead in traffic, almost doubling his closest rival. New O.R.S.: AKC; new O.P.S.: DSY, BMR. TJ has Tennessee and South Carolina schedules on 3.5 Mc. ANU reports rag-chewing on 3.9 Mc. AAK moved to new home. DGV is experimenting on 28 Mc. and fatchewing on 3.9 Mc. DGU expects to cool off his mike and take a bit of time on 3.5-Mc. c.w. CLB has W.A.S. FLC is experimenting with low power. TW returned to 28 Mc. along with FVD, CRW and HX. ESO is operating State College Station ATC with some college traffic. DSY has west coast schedule and New England schedule daily. CCO is on 7-Mc. Army Net. AKC is in same network. Gastonia Club organized and will be functioning in short time. Greensboro has a wave of 1.75-Mc. 'phone operation with low power for local contacts. Active stations are QO, ZH, AIT and MR. CAY has rig functioning on 3.9 Mc. AYF may be heard on 3.9-Mc. 'phone. BX finally has rotary going. EYF is a proud poppa, a YL. Congrats! Thanks to the Charlotte Club for the excellent hamfest on Nov. 5th, John Reinartz, W1QP, gave a very interesting talk on frequency standards. To each and every one we want to extend our Season's Greetings and best wishes for a Prosperous and Most Enjoyable New Year, 73 - Buck,

Traffie: W4ECH 146 DLX 76 AKC 68 CCO 49 DSY 14 ATC 7 TJ 5 TW-ANU 4.

SOUTH CAROLINA - SCM, Ted Ferguson, W4BQE/ ANG - DRE had nice score in O.R.S. Party, CZA is busy with T. L. "C," and says traffic is increasing. FFO is changing his rig from bread board to rack and panel. GCJ has his O.R.S. appointment. EXJ is active on 1.75-Mc. 'phone and has regular schedules with FMS. EXY changed OTH to Bennettsville. Welcome, OM. EZF takes active part in 1.75-Mc. 'Phone Net. CEL has new HQ120 receiver. CXO is active on 3.9-Mc. 'phone. CQU has regular schedules with DXF and 1LMQ. FMZ, active on 3.5 Mc., schedules DXF. AFQ is active in both 3.9-Mc. 'Phone and A.A.R.S. C.W. Nets. EPJ did a nice job in SS. GAR will be back on with new rig. EJK, FNC and the gang attended the hamfest at Charlotte. DAM took part in the SS. CSP is using cathode modulation to HK-54. FYL continues on 1.75-Mc. 'phone, FVF will have a 250-watt rig on 7 Mc. GCW added a 6L6 final to rig. GCS and GKD are new hams in Columbia and GJF at Barnwell. Welcome, fellows. CL is on 1.75-Mc. at times. FHE takes part in the 1.75-Mc. 'Phone Net with 15 watts. The following make up the 3.9-Mc. Phone Net: AZT is N.C.S., AFQ, BSS, CHQ, CQG, CXO, EPJ, BPD, DX, MJ, TL and BWQ. They would like to have more 3.9-Mc. 'phone fellows in the net. DMX is rebuilding. Let's have more reports on your activity, gang. Give your Section Manager a lift. Thanks, 73. - Ted.

Traffie: **W4**AZT 54 CZA 53 EPJ 27 CQU 23 FNC-FMZ 22 CXO 16 AFQ 15 FFH 12 BPD 11 EZF 8 FFO 9 EJK 6

EXJ-EGH 2 CSP 1.

VIRGINIA - Acting SCM Frank S. Anderson, Jr. W3GWQ - HWJ has RK20A on the air with new 6L6 oscillator, and is using vacuum tube keying. FBL is trying to organize a 56- or 28-Mc. Net in Richmond and vicinity. RZ is back on after twenty years, operating 14 Mc. with a pair of T40's, 300 watts. IKV is new Norfolk ham. HAD is back on after a one year recess. HAE reports the Norfolk Radio Club meets every Friday night and is very active. ELJ does his operating on a Flying Fortress Bomber at Langley Field, FMY is back on regularly on 14 and 3.9 Mc. HNX is building new rig, P.P. 100TH, with cathode modulation. HRC, GUZ, GIC, IED, BRA, HRC and GOH are all at V.P.I. for the winter. HJW moved to Hampton: has new receiver and transmitter, running 2½ watts on 1.75 Mc. HAO spends 80% of his time rag-chewing, IKY is new Richmond ham, IJX-W4CZC is new Richmond ham, UVA is now at Tuscaloosa, Ala., but, judging from his letter, the training as a Flying Cadet takes up all his time and he cannot get on the air as yet. GWQ worked three new states in the S.S. HBH/IFZ would like to hear from any Virginia ham who is interested in handling traffic; stations are needed in Bristol, Bluefield, Jonesville, Winchester, Norton and Northern section of the State. IFZ received appointment as A.A.R.S. alternate S.N.C.S. and call WLON

Traffie: W3ELN 185 GWQ 10 FMY-FBL 4 HWJ 2

HBH/IFZ 178.

WEST VIRGINIA - SCM, W. D. Tabler, W8OXO -With this month's Section news, the new SCM makes his initial appearance, and takes the opportunity to thank the West Virginia gang for the confidence they have expressed. If you will send along all the news with your monthly reports, we will continue to make this a good column, RHM moved to Akron, Ohio. Hams at WSWV: BOW and PTJ. At WMMN: MKE, ESQ, GBF, CLQ and CVX. At WMWV: ELO. LCN received genuine boomerang from VK3BG, 2CTT is back at W.V.U. TNC is doing excellent work on 56 and 112 Me. FAA is back on the air on 7 Me. JRL visited in Huntington. DFA has new 3-element beam and has worked 60 countries. New officers of M.A.R.A.: JRL, pres.; RFP, vice-pres.; Chas. Handy, sec'y; MIP, treas., and NTV, activities mgr. TNC made fine score in Oct. O.R.S. Party, with GBF, JM and OXO also participating from the M.A.R.A. BOK has new e.c.o. KWI is working nice DX on 28 Mc. GBF divides his time between building e.c.o.'s, working new countries and being N.C.S. of the 3770-Kc. Net, which is expanding very nicely. CVX and CLQ are back on after long absence. ESQ is rebuilding rig to suit his new QTH. MIP is on 14-Mc. 'phone. DYB has regular schedule on 7 Mc. with K6QMC. BWK started Ohio River Net for winter season, PSR is N.C.S. of 3700-kc. W. Va. Net. 6:30 P.M. daily.

Traffie: W8PSR 76 TNC 10 BWK OXO 219 GBF 26 EHA 15 MKE 15 BOK 12 SIG 9.

(Continued on page 104)



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Correspondence Department

(Continued from page 98)

is not in absolute control of all his faculties has any business being; in a place where death by electrocution is never more than a few feet away. . . . Think about it fellows, and try to remember, regardless of how many you've had, to stay away from your station when you're not cold sober. And for your own sake — yes, and for the sakes of all the amateurs in this country — if you do go into the shack, be mighty careful, and please reach for the key instead of the mike so that the general public won't be subject to your inane babbling.

- Joe Hassett, W8PVB

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NOVEL ANTENNA TECHNIQUE

7105 Ilex St., Houston, Texas

Editor, QST:

I have come to the conclusion that now is the time to unburden my overflowing heart. I wish to discuss antennas. For the past twenty years I have been industriously investigating antenna phenomena. I have built the huge 80-foot high and 100-foot long antennas used in the old spark daya.

. I have used verticals, Zepps, off-center-fed, Marconi's—beams of all kinds, sizes and colors. I have spent sleepless nights wondering which was the better antenna. I have learned great quantities of new cuss words trying to tune the things right to the exact point of efficiency. Yeah—I have done all those things even as you have. But—one thing I have never done. I have never built a tuned, untuned, or twisted pair feed line that didn't have standing waves on it

Most hams, especially the old timers, swear by the Zeppfed lines. For many years I have pondered this question. I have always maintained that the Zepp-fed system is a classical example of standing waves on feed lines. I don't think that I will get much argument regarding the results obtained using Zepp feeders. We all know how they operate.

I have collected authentic information regarding cases where fellows had their antennas torn off of the Zepp feeden by winds and still were able to operate the station with fair results.

I have made charts, calculated stray superfluous fields, measured electronic flow, and otherwise investigated antenna phenomena, and I have come to a most astounding conclusion.

I have discovered that antennas are utterly useless. I have used one of my feed lines, the common 500-ohm variety, and very carefully cut it at a random length and thereby secured most excellent standing waves; and without the assistance of any antennas at all I have sent signals over tremendous distances. Those of you who work 10 meters will no doubt have heard me doing antenna work via WSCCU. I have developed this most astonishing transmission technique and wish to pass it on to experimenters. I find that the feed line works better if it is transposed every 3 feet. However, twisted feed line functions very well also. I have never had any trouble in securing standing waves along twisted feed lines.

Now, any of the boys desiring to use this most remarkable antenna system, just put up the feed line and leave off the antenna. You should have no trouble at all securing standing waves; I don't. Just turn on the rig and presto! the DX just rolls in.

(P.S. I find that the affair works better if the feed lines are separated so that they are at right angles to each other and in the same plane. Hi!)

- Jim Hunt, W5TG-W5CCU



Gil drew this for our Christmas issue — we wish it were true! — ED.

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Chassis to fit this cabinet, 10" x 17" x 3" 80c



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SX 24 SX 23 Sky Buddy	\$81.50 127.50 29.50	\$16.30 25.50
S-20-R Sky Rider 510 Sky Rider Marine	49.50 69.50 64.50	* 13.90 12.90
*Indicates sets sold	for cash	only

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500 500	4.4	5 x 3 4 x 15 8 5 x 3 4 x 134	1 ½ lbs. 1 % lbs.	1.50
500 000	8	334 x 3 14 x 1 78 5 x 3 18 x 3 12	1 34 lbs. 2 34 lbs.	1.90 2.75

1000 v. DC. 2 mfd. 2³/₄ x 1³/₄ x 1. Weight ½ lb.

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Send down payment with order, add 6% carrying charge to balance, and divide into 12 monthly payments or less. All sets complete, ready to use.

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HUDSON DIVISION

EASTERN NEW YORK — SCM, R. E. Haight, W2LU - 8DSS and YF paid a visit to LU and BSH. HCM reports new 1/2-wave, 3.5-Mc., end-fed Zepp. JZG reports club station SZ getting repaired for activity. BEW installed remote control; no more freezing! LLU reports activities 2% traffic, 93% R.C. and 5% experimenting. KFB divides time between 3.5-Mc. and 1.75-Mc. 'phone. ACB as E.C. requests more members in A.E.C. and portable equipment. KXF is busy with A.A.R.S. and T.L. "G." ALP reports several 21/2-hour QSO's with 6USA without a break. VJ will be on 7 Mc. with pair of 10's. KCG has SX16 receiver and is on 7259 kc. MCY in Hartsdale is active on 28-Mc. 'phone: father-and-son rig. LAD is new A.E.C. member. We welcome HZJ as new A.R.R.L. member. WLNY-W2KWG requests new members for the A.A.R.S. Note to all O.R.S.-R.M.-O.P.S.-O.B.S.: Let us get started right in this New Year of 1940 and all hands send in your reports. 73 .-SCM

Traffic: **W2**KWG 100 (WLNY 33) KXF 156 LU 49 HCM 6 SZ 3 BEW 2 LLU 1.

NEW YORK CITY AND LONG ISLAND—SCM, Ed L. Baunach, W2AZV—CHK is now Emergency Coordinator for Nassau County. All stations interested in joining the A.E.C. and becoming assistants in the county should get in touch with him. LR is chairman of the Red Cross disaster relief committee for Suffolk County, in charge of communications. The Section Traffic and Emergency Net operates every night at 8:30 P.M. on 3710 kc. Anyone desiring to move traffic should call in on the net. IOP made the B.P.L. EVA joined the A.A.R.S. SC's total is a knockout, KI schedules 3BWT, PF is busy on A.R.R.L. planning committee. HYJ did some fine work in the U.H.F. contest. CWP reports new quarters for the "73" R.C. at 870 Riverside Drive. All of the gang are welcome to attend the meetings. The members of the TENMEN R.C. are AEU, HLI, KKW, KLD, LAR, LRD and LXD. More are welcome. Get in touch with AEU, MLE is out for O.R.S. EXR is on daily at 7 P.M. on 3730 kc. looking for traffic. KUY is getting ready to operate on "21/2." LGK operates on the Section Net with 4 watts into a 41. Ex-2AYY is now Asst. Comm. Officer of the 258th Field Artillery, 29 W. Kingsbridge Road, N.Y.C., and is looking for some good operators. All those interested should get in touch with him. There are chances for regular ratings. MDL is recuperating from appendicitis operation.

Traffie: **W2**SC 944 LZR 335 IOP 310 ITX 140 LR 104 KI 92 AZV 81 HMJ 67 PF 54 AXZ 52 EXR 48 GDF 39 DBQ 37 (WLNB 109) CHK 38 AEU 28 IRC 26 HYJ 15 LGK 14 CLA 12 EC-JJN 10 AA 9 CET 8 AZM-ADW 7 DOG 6 CIT-DLR 5 HJT-AVS-LID-HBO 4 HGO-GRJ 2 EVA-ELK 1.

NORTHERN NEW JERSEY - SCM, Pat Jessup, W2GVZ — R.M.'s: BCX. BZJ, CGG, GVZ, MHF. P.A.M.: HNP. Section Net frequencies 3630 and 7070 kc. New appointments: R.M., MHF; O.R.S., MHF. A new Section Net (N.N.J. 2) is being organized on 7070 kc., with MHF as R.M., to run several nights a week from 7 to 7:30. A new A.A.R.S. N.J. Net has been formed on the same frequency for operation, 6:30 to 7 P.M., with MHF as N.C.S. It is expected that the two nets will provide each other with traffic outlets. That freq. now becomes the N.J landmark on 7 Mc. The N.N.A.R.C. of Newark and the R.V.R.C. of New Brunswick each threw an annual eatfest. Present officers of N.N.A.R.C.: JLX, pres.; IGW, vice-pres.; IYQ, sec.; LCA, treas. The L/C Club of Jersey City is now affiliated with the League. ILE now has an emergency-powered rig perking very FB. CTT is at W. Va. Univ. and puts in an S9 signal on three bands from the college station 8TNC, LMX wants O.P.S. So does 3COP/2, who "usta and yens to be JME." LLS has new Jr. op. FB. CIZ is building another rig. MKW, KMI and 5HUH/2 joined A.A.R.S. The T.L. "L" job is open. An error was made in computing GSA total in W/VE contest, and it looks like he might be first for N.N.J. and second for the country. BHW, CMY and JT are still finding and working new countries. If you think DX can't be worked from hereabouts, just take a look at where GT stands in the DX C.C.!

Traffic: W2GVZ 286 (WLNI 13) HCO 206 5HUH/2 160 LMN 151 MHF 91 KHA 81 LXI 64 JDC 37 HQL 34 (WLNR 8) KM1 34 JUU 9 JKH 3 IYQ 2 CIZ 1 BZJ 14, Sept.–Oct.: **W5**HUH/2 29 2CIZ 1.)

NEW ENGLAND DIVISION

CONNECTICUT - SCM, Frederick Ells, Jr., W1CTI — Nutmeg Net: 3640 kc., 6:45 p.m., daily exc. Sun, AW leads off again in traffic. At 10:30 p.m. EST AW is N.C.S. for National Trunk Line Net on 3670 kc. KKS added RK20 and was appointed O.B.S. The Manchester Radio Club had Wolcott Smith of Sickles Co. and Ray Woodward 1EAO as speakers recently. MFC is new YL ham in New Haven, on 1.75-Mc. 'phone. ITI takes Trunk C" schedule Tues. JYJ gets out nicely with 5 watts portable from Brown U. BCG has new SX24. AFB is active on Trunk "C." BDI worked 9RGH on 58 Mc. In the second U.H.F. relay INF bandled traffic with 9ZHB. TD took part in O.R.S. party and SS. ES is cruising the ether waves more now the boating season is over. Seventeen members of the New Haven A.R.A. reported a total SS score of about 243,000. Visitors at DWP were FBJ, 2HWE and 1CCF, BHM worked XU8MI. At the Annual meeting of the Willimantic Radio Club KYQ was elected pres., JEI vicepres., MHF secy. and treas. HYU is active on 1.75-Mc. phone. KV has been appointed state N.C.S. for Conn. A.A.R.S. AMQ is Alternate. VB is Alternate N.C.S. of T.L. "AP" Net. AMQ worked Nevada in SS for last state for W.A.S., after 11 years on the air.
Traffic: W1AW 703 KKS 224 KQY 211 JXP 286 CTI

Traffie: **W1**AW 703 KKS 224 KQY 211 JXP 286 CTI 190 JMY 148 (WLGQ 18) ITI 144 AMQ 138 JQD 84 KYQ 83 BCG 78 UE 68 KFN 67 AFB 43 AFG 31 LVQ 34 LUN 26 BDI 19 TD 14 ES 12 DWP 8 EFW 6 GB 1.

MAINE — SCM, H. W. Castner, WHHE — I want to thank all you boys for the wonderful help and widespread response from all over the state. We have practically completed a definite coördination between the Pine Tree Net, the N.C.R. and the A.A.R.S. Here are the top officials of each net: Perley Swasey, Jr., W1GOJ, Falmouth Foreside, Chief Route Manager of the Pine Tree Net; Alton H. Gould, WLGT/W1CFO, 107 Mabel St., Portland, State Radio Aide, A.A.R.S.; Norman A. Partridge, W1BWR, Winthrop, Operations Officer, Section 1, N.C.R.

All-Maine QSO Party

I want to announce to everyone the All-Maine QSO Party, Jan. 13th and 14th. The boys at the Univ. of Maine Radio Society, station W1YA, are sponsoring it this year. Time of the contest: Noon until Midnight, Sat. and Sun., Jan. 13th and 14th. Scoring: One point for each contact on the same band. Two points for each cross-band contact, Two points for each 'phone-c.w. contact. Total score shall be multiplied by the number of different towns worked, Single operator stations shall multiply their total score by 11/2; stations working W1YA shall multiply their total score by 10. (Working same station twice does not count.) Copies of the logs of the stations competing for prizes must he sent to W1YA, Univ. of Maine Radio Society, Orono, postmarked not later than Jan. 22, 1940. They must include date, time, both RST reports and location of stations worked. First prize - 50-watt Western Electric tube, and plenty of other prizes. Every Maine amateur is invited to participate and we expect it to be the biggest affair ever held in Maine. Spread the news around and be with us. Further information can be obtained from "Howie" M. Kenney, W1JCP, at Phi Mu Delta House, Orono.

The U.S. Naval Communication Reserve is certainly going strong. There are about 135 officers and men on the rolls in Maine. N.C.R. stations are located in Sanford, Portland, Auburn, Rumford, Livermore Falls, Brunswick, Augusta and Rockland, with alternate stations at Hancock, Jonesport, West Baldwin, East Parsonsfield. Drills are on 2096 and 2576 kc. Several units have good emergency set-ups and much is being done along the line of preparation. Drills on Monday nights are at 8:00 P.M. IQZ took a "whack" at being N.C.S. of the P.T.N. and did a fine job. GPQ should be on soon with those 100 watts. GQ is back on the P.T.N. HSE is doing fine job on P.T.N. If anyone wants to hear a sweet T9 signal give a listen to INW any night on the P.T.N. Many of the boys around the state are on spots near 3597 kc., and we ask your help to refrain from QRMing the P.T.N. on that frequency between 7:30 and 8:00 P.M. week-nights except Sat. When you hear QNF that means the net is over. Thanks, ITH and KVK are doing a swell job in Madison on the P.T.N. KLH in Hancock is doing a fine job of operating. Give a listen to LWG if you want to hear a

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smooth fist. Your SCM has been approached by the A.L.A. They want daily "road weather conditions" reported, to be used on the Yankee Network. The matter is being thrashed out at present. MFJ put up a new skywire. IGW is doing a fine job on 1.75-Mc. 'phone. EZR is on 3883 kc. LRP is rebuilding for 3.5 Mc. FBJ says the Portland Amateur Wireless Ass'n set Dec. 9th for the annual hamfest. A plan is being worked out with the permission of A.R.R.L. to put on some very interesting sketches about Ham Radio, taken mainly from the fine book, "Two Hundred Meters and Down," over WGAN in Portland. Watch for these and tell the other hams about it. FBJ is rigging up an outfit at the office, so he can run a little QSO now and then after the business routine subsides. APX says they have Rangeley 100% organized for the Emergency Corps and 100% League members. They meet once a month in order that each may know all about the others' stations and facilities. We extend a very cordial welcome to the ham ranks to "Doc," HYC. MDF is on 7 Mc. HSE has only four more to go for W.A.S. on 3.5 Mc. BOK worked Nevada and completed W.A.S. APU has fine new beam. DPJ is putting up a beam for 28 Mc. We have 44 separate official stations in Maine; there are 30 O.R.S., 16 O.P.S. 15 E.C.'s, 9 R.M.'s, 5 P.A.M.'s, and 4 O.B.S. Out of the 44 stations, I received only 17 reports up to Nov. 20th. Of the 15 active stations on the Pine Tree Net, who have handled a lot of traffic, I have only received 5 reports. Please do the same in reporting as you do in activity and Maine will go over the top! New O.R.S.: LYK, APX. New E.C.: APX.

Traffie: W1HE 97 GXY 8 LML 74 EUL 3 QH 2 LYK 18 LYJ 2 KVK 6 GOJ 184 FBJ 23 LMQ 31 LWG 12 LIC 3 DPJ 5 HSE 29. N.C.R. Traffie: 241 A.A.R.S. Traffie:
 W1BTA 42 CFO 212 EFR 39 FAP 106 GE 52 GVS 133 HSD 11 IOM 4 IJF 30 IST 37 KMM 54 KOU 216 LML 63

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EASTERN MASSACHUSETTS - SCM, Larry Mitchell, W1HIL — Ass't S.C.M.'s: 1JJY, 1GAG, Chief R.M.: 1JJY, P.A.M.: 1GAG, Chief E.C.: HXE, New O.B.S.: COL, EHT, ZE, New E.C.'s: JMJ, JGL, New O.P.S.: ERH. Eastern Mass. Net meets daily at 7:30 p.m. on 3745 ke., with following members: BB, BDU, BMW, JJY, JSM, KZT, LBY, LVV, LWH, MX, QW. Emergency Coordinators: HXE, KBQ, JJY, KMY, QW, HSR, BMW, JCK, LUG, JMJ, JGL. Official Observers: GAG, BHW, LNN, IBF. Official Broadcasting Stations: JJY, GAG, LMO, LMB, HDJ, COL, EHT, ZE. Official 'Phone Stations: GAG, HIL, JGQ, AAR, JCX, LMB, JDG, BB, LO, ERH. Route Managers: JJY, EMG, QW, GCU KTE. EPE, JSM, KZT, Official Relay Stations: LMO, KH, EPE, KCT, JJY, BDU, HWE, IGN, BMW, KCQ, QW, FWQ, AKS, EMG, AGX, HSA, LBY, BB, LWH, JCK, JSM, KZT.

The SCM's duties make it necessary for him to resign. All active amateurs are therefore requested to report activities on the 16th, to the Acting SCM, Carroll O. Peacor, WIGAG, 24 Governor Rd., Stoneham, Mass. Call for nominations for SCM will appear in next OST.

It is plain to see we are enjoying a fine steady growth. Keep it up, gang. HIL attended a fine meeting of the Merrimack Valley Amateur Radio Club on Nov. 8th, and gave a talk on "The Life of an SCM" This club publishes a fine little magazine once a month. HXE has taken hold of chief E.C. job in fine shape, and is getting things lined up all over the Section. JJY sent out a fine issue of the E. Mass. O.R.S. Bull, with traffic schedules and dope for the Section. Very FB, Bud. MD, holding this call since 1919, just completed his 20th year as a licensed ham. FB, OT. QW returned from honeymoon in Washington, D. C.; is now working into E.M.N. LXQ works Ohio and N. Carolina on 1.75-Mc phone. The Parkway Radio Club meets 1st and 3rd Thurs. at Fedalia Hall, Washington St., W. Roxbury. Following are officers: Pres., KQN; vice-pres., KVH; sec. and treas., IPF. KTE had fine time in last O.P.S. party; scored 2499 with low power. IBG got married. HRB is on 28 Mc. with fine results. IYG was visited by 4EEM, 1KON, LEU, LTC, IDL. MGY, only 15 years old, is new member of M.V.A.R.C, MCD is now at Panama Canal Zone. JNU is active on 1.75-Mc. 'phone and sending code practice. FB, Archie. AHE is on 28-Mc. 'phone. LEA has W.A.S. almost collared, HXE has three states to go for W.A.S. FCR is on 14-Mc. 'phone. FCU is working in Florida. Any of you fellows interested in obtaining inexpensive motor generators

contact HXE who has the data. KMQ is very active in A.A.R.S. LTC is putting up 50-ft. tower, 6NWP-1, 1LEU, LTC, GFW, LO and 3-S.W.L.'s had pole raising bee at LMB. DNL and BJB put in Meissner Signal Shifters. LQV is active with traffic. HWE is active in Danvers. EHT was active in U.H.F. contest; received message from 3RL on 56 Me. with 7 relays. LMO reports lots of fun in Oct. O.R.S. contest, COL reports A.A.R.S. plans to have local "21/2 Meter" Net. AHP of Fall River is active on 112 Mc. Am sorry to report that, due to changes in working conditions here, I am now forced to spend about 25 days per month on the road. I do not feel I can continue the work of SCM for this Section. Therefore, I am sending in my resignation as your SCM, effective Jan. 1. Please watch for a listing of your new SCM on these pages. Thanks for your cooperation, and please do as much for your new SCM Thanks and 73 to all. — Larry.

Traffie: W1LWH 694 KMQ 160 JSM 149 BDU 130 EMG 126 (WLGF 64) IUQ 93 AKS 280 HWE 64 KCT 150 MX 38 EPE 200 BB 38 JCK/250 (WLGV 82) QW 37 (CC1C 45) AGX 37 IBF 18 COL-LMO-EHT 14 LQV-HIL 9 KTE 17 LBY 119 JFS 59 JJY 215 MEU 220 KHE 5.

WESTERN MASSACHUSETTS — SCM, William J Barrett, W1JAH - BIV leads the traffle parade this month with nice total, JAH visited BVR, IOR, HNE, LSZ and BIV; also attended meeting of Worcester Radio Ass'n, BKQ. AZW reports new emergency outfit nearly finished with battery-powered rig and receiver in portable case. That's the spirit, Prent, we need one of 'em in every town. LJF sends in first report as O.R.S. DCH reports that JXE had a tower raising bee and now has the flat-top up 67 feet. KZU is now W.A.S. on 'phone, and worked XU1B for W.A.C. on 'phone. LRE is on 28 Mc. with HY25's. CQR is pumping 600 watts into 100TH's. 73 to all, and best wishes for a Happy New Year, Traffic: **W1**BIV 222 DUZ 81 JAH 79 (WLGH 10) AZW

74 BKG 50 FOI-DCH 24 BVR 22 (WLG 181) GZL 22 AJ

17 LRS 2

NEW HAMPSHIRE - SCM, Carl B. Evans, W1BFT-DMD - The M.V.A.R.A. was active in the SS, with members comparing notes on stations and sections worked, flexibility of their e.c.o.'s and "getting-out" ability of their antennas. IVU moved to new QTH in Manchester. ATE has new RME-70. LSY has a Breting 9. MAS, new Hillsboro ham, is active on 28 Mc. IJB reports excellent results with new Hetrofil. LIN is proud possessor of an RME-69. ILK, the St. Paul's School Radio Club, is active on 14 Mc. FTJ worked all U. S. Sections in the SS as well as W.A.S.

Traffic: W1FFL 404 KIN 144 BFT 113 CMR 95 JGI 92 IDY 81 GMM 77 KBU 58 ICS 56 EWF 41 JKH 38 JBA 35 IP 33 JDP 27 KKQ-HQS 25 LNG 16 EAL 14 CEA 15

AEF 10 ITF 12 JBM 5.

VERMONT - SCM, Clifton G. Parker, W1KJG -Burlington Amateur Radio Club has rig installed and operating. New officers. BZS, pres.; Peter Waterman, vicepres.; GAE, secy.-treas. Club recently carried out a twoway communication demonstration. BZS is on 3605 and 7210 kc. and has new Sky Buddy. MIH is new amateur at St. Albans. MCQ and XYL entertained in an Armistice-Radio week-end with JRU, KJG and XYL's. Green Mt. Radio Club new officers: AAJ, pres.; GAZ, vice-pres.; Harry Noyes, secy.; Erwin Bradley, treas. GAN is working out Emergency 'Phone Net for Vt. Section. KOO is sporting around over the bands with a new signal shifter. KVB changed QTH to Mass. Vt. Hamfest was successfully carried out by the Green Mt. Radio Club. Thanks, gang, from the rest of the Section - KXY and XYL spent week-end with FSV. KUY and LPL are about to leave the state of single blessedness, according to announcements circulating the Section. Congrats. JVT is on 3.5 Mc. A.A.R.S. Net for 1939-40 season has FSV as S.R.A., KJR as S.N.C.S., KIE as S.N.C.S. 2, KTB as S.N.C.S. 3, KJG as S.N.C.S. 4 and JRU as S.N.C.S. 6 ('phone). MCQ was appointed O.P.S. and Ass't E.C. for Stowe area. A Morrisville boy, Fred Dustin, with the Byrd Expedition, advises they will have traffic for Vermont, and are anxious to secure Vt. contacts. Watch for KC4USA-B-C. You will find dope on their operations in Dec. 1939 QST. This Section is handling a great deal more traffic than is being reported. What say, fellows? Hope you can get those reports in each month. A 56-Mc, station is planned atop our highest peak - Mt. Mansfield. More definite information later.

Traffie: W1FSV 52 KOO 18 MCQ 11 KJG 82.



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Strays **

Try This on Your Piccolo

"I play drum in our local high school band. We have worked up a cadence that sends code. We use one which represents 'HI,' and at other times one representing 'Test.' For special occasions we use one which expresses '88.' More than once we have attracted the attention of hams at football games. When we hear an answering CQ' or 'Hi' whistled from the stands, our trumpet player, soon to become a ham, blows my call letters."

-W6PMV

That trumpet player is making an early start at call-bootlegging!

O Measurements

(Continued from page 51)

the frequency divided by the band-width at 70.7% of the resonant voltage.

This same general method of attack may be used when only one frequency is available. In this case, a calibrated variable condenser is necessary. Referring to Fig. 3, suppose we keep the frequency constant and vary the capacity of the condenser both above and below the value at resonance. A curve similar to that of Fig. 2-A would result if capacity were plotted against the voltage e. From this it appears that the change of capacity necessary to drop the voltage to 0.707 maximum might be used as the change of frequency was used in the last derivation.

The reactance of Fig. 3 is equal to the difference between the inductive and the capacitive reactances, or, when e is equal to 70.7% of E,

$$2\pi fL - \frac{1}{2\pi fC_2} = \frac{1}{2\pi fC_1} - 2\pi fL = R = X$$

where C_1 and C_2 are the capacities necessary to drop the voltage as indicated. Adding these two equations and combining terms (App. 10)

(Continued on next left-hand page)

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ITENTS HIRAM PERCY MAXIM MEMORIAL STATION, WIAW THE AMATEUR - HIS CODE OF ETHICS Frontispiece: INTRODUCTION Chapter 1 STORY OF AMATEUR RADIO Chapter 2 GETTING STARTED PRINCIPLES AND DESIGN ELECTRICAL AND RADIO FUNDAMENTALS RECEPTION OF RADIO SIGNALS TRANSMITTER DESIGN MODULATION CONSTRUCTION AND ADJUSTMENT 103 Chapter 3 Chapter Chapter 5 Chapter Chapter 17 MEASUREMENTS AND MEASURING EQUIP. 258 273 286 Chapter 18 MENT ENCY AND PORTABLE Chapter 18 STATION ASSEMBLY Chapter 19 TUBE CHARACTERISTICS AND MISCELLANE 294 Chapter 20 OUS DATA OUS DATA ANTENNAS 344 ANTENNAS 341 ANTENNA FUNDAMENTALS 356 R.F. TRANSMISSION LINES 364 R.F. G. WIRE ANTENNAS CTIVE SYSTEMS 371 MULTI-ELEMENT DIRECTION MULTI-ELEMENT DIRECTION ANTENNA CONSTRUCTION Chapter 26 Chapter 27 Chapter 27 Chapter 29 Chapter 29 Chapter 29 Chapter 30 Chapter 21 Chapter 22 Chapter 23 Chapter 24 Chapter 3U ANTENNAS FOR THE U.H.F. HANDLING OPERATING AND TRAFFIC HANDLING Chapter 31 OPERATING AND DATA Chapter 32 REGULATIONS AND DATA Chapter 32 REGULATIONS AND DATA INDEX Chapter 25 Chapter 26

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American Radio Relay League West Hartford, Conn., U. S. A.



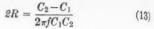
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Since C_1 and C_2 are just slightly different from C_r (one higher and the other lower), it is almost exactly true that $C_1C_2 = C_r^2$. (13) may now be written

$$2R = \frac{C_2 - C_1}{2\pi f C_r^2} \text{ or } \frac{C_2 - C_1}{2C_r} = R(2\pi f C_r)$$
 (14)

Since at resonance, $2\pi fC = \frac{1}{2\pi fL}$, it is seen that

$$\frac{C_2-C_1}{2C_r}=R\left(\frac{1}{2\pi fL}\right)=\frac{1}{Q} \text{ or } Q=\frac{2C_r}{C_2-C_1} \ \ (15)$$

(15) is another one quite commonly used to determine Q.

Before leaving the theory for the practical means of applying these equations, we had better

$K = \frac{f}{f}$	$\frac{1^2 - f_2^2}{4\pi^2 f_1^2 f_2^2} \times$	10^{12}	L = -K
n	$4\pi^2 f_1^2 f_2^2$		$C_2 - C$
f_1	f_2	K	
912	456	91,365	
1200	600	52,770	f = Ke.
2000	1000	18,998	$L = \mu h$.
4000	2000	4,749	$C = \mu \mu f d$.

discuss one more method. This one has recently become one of the most common methods of measuring Q.

The circuit in Fig. 3 has been redrawn in Fig. 4-A. At resonance, the external circuit from A to B has an impedance $Z_{AB} = R$. The circuit represented by the inductance L and its losses R has an impedance $Z_L = \sqrt{X_L^2 + R^2}$. Fig. 4-B shows another configuration of Fig. 4-A, and Fig. 4-C shows the same circuit in terms of impedances. At resonance, the voltage e across the coil is to the total voltage E as the ratio of the respective impedances, or

$$\frac{e}{E} = \frac{Z_L}{Z_{AB}} = \frac{\sqrt{X_L^2 + R^2}}{R}$$

This may also be written in the following forms:

$$\frac{e}{E} = \sqrt{\frac{X_L^2 + R^2}{R^2}} = \sqrt{\frac{R^2}{R^2} + \frac{X_L^2}{R^2}} = \sqrt{1 + Q}$$

In the practical case, Q will rarely be less than 10, so that the 1 under the radical may be neglected without introducing too much objectionable error. Then,

$$Q = \frac{e}{E} \tag{16}$$

WIND OUT OF THE PROPERTY OF TH

Practical Applications of These Equations Band-Width Method

From (12),

$$Q = \frac{f_r}{\Delta F} = \frac{f_r}{f_1 - f_2}$$

Equipment:

- Frequency calibrated oscillator.
- 2. Voltmeter with band-width calibration.

(Continued on next left-hand page)

City



All these (and every other good make, of course) are right here in the store to spell out my Greetings of the Season to you.

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Fig. 5-A shows the circuit generally employed. A vacuum-tube voltmeter is used to measure the r.f. potential. In Fig. 5-B R_{BC} is 70.7% of R_{AC} With the switch in the A position, R_S is adjusted to give a convenient deflection of the voltmeter. This will be referred to as the peak voltage deflection This value is recorded and the switch turned to the B position. The deflection obtained will be called the band width deflection. By repeating this procedure for different settings of Rs, a series of peak versus band-width deflections will be obtained. These values should be plotted on graph paper, as shown in Fig. 6. The voltmeter deflection corresponding to 70.7% of the voltage necessary to produce any given deflection can then be read from the graph. If the frequency of the supply voltage is 60 cycles, the resistors need not be non-inductive. This frequency is readily available in most locations and is satisfactory for most Q-measurement voltmeter calibrations.

The procedure is as follows:

 Couple the oscillator to the coil with a oneturn link.

Tune the coil to resonance (maximum deflection of the voltmeter) with the capacity.

 Adjust the coupling so that when tuned exactly to resonance, the circuit will cause a nearly full-scale deflection of the voltmeter.

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 Measure the frequencies above and below resonance at which the voltmeter reads the band-width deflection corresponding to the peak deflection which occurred at resonance.

 To determine Q, divide the resonant frequency by the difference between the two frequencies determined in step 4.

Capacity Method

From (15)

 $Q = \frac{2C_r}{C_0 - C_1}$

Equipment:

1. Single-frequency oscillator.

2. Calibrated variable condenser.

Voltmeter with band-width calibration.
 Fig. 5-A is also applicable to this method.
 The procedure is:

1-3 incl. Same as in previous method.

 Measure the capacities above and below resonance at which the voltmeter reads the band-width deflection corresponding to the peak voltage deflection which occurred at resonance.

 To determine Q, divide twice the capacity at resonance by the difference between the capacities determined in step 4.

The accuracy of this result depends upon the accuracy of the determination of the resonant capacity. If the coil has a high distributed capacity, the resulting error may be appreciable. It is therefore desirable to determine the distributed capacity by applying (5). This makes it necessary to use another frequency, but since this might well be chosen as twice the frequency used in (15), this represents no problem. In applying (15) al-

(Continued on next left-hand page)

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TABLE III

Method Frequency Single-frequency Single-frequency Two-frequency

600 kc. 1200 kc 1200-600 kc. Inductance 171.6 µh. 219 0 159.9 (correct)

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ways be careful that neither the distributed capacity of the coil nor the shunting capacity of the leads is high, or the determination of Q by this method will be badly in error.

Voltage Gain Method

From (16)

$$Q = \frac{e}{E}$$

Equipment:

- 1. Single-frequency signal generator or oscillator.
- 2. Calibrated voltmeter.
- Non-inductive low resistance.

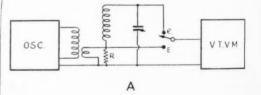
Fig. 7-A shows the circuit normally used. Fig. 7-B shows one method which may be used to calibrate the voltmeter. To obtain the voltage across the vacuum-tube voltmeter, divide the voltage read on the a.c. input meter by the ratio of the total divider resistance to the resistance across the tap.

The voltage is introduced into the resonant circuit by applying it across the low resistance R. This resistance must be low enough so that it is an inappreciable part of the total resistance of the circuit. In practice, it is usually about 0.05 ohm.

The procedure is:

- 1. Tune the circuit to resonance.
- 2. Measure the voltage at E.
- 3. Retune with the voltmeter at e and measure.
- 4. To determine Q, divide e by E.

(Any of the above methods do not measure the Q of the coil alone but give the Q of the coil in combination with the condenser. Normally the Q of the condenser is so high that the figure ob-



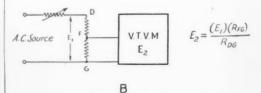


Fig. 7 — The circuit used in measuring Q by the voltage-gain method. The r.f. portions of the oscillator should be shielded if the v.t.v.m. picks up radiated energy. B shows the circuit used to calibrate the v.t.v.m.

(Continued on next left-hand page)



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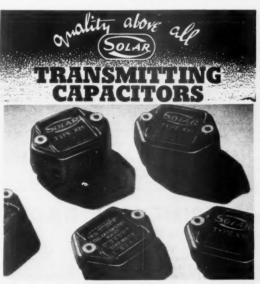
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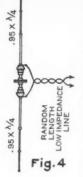
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tained is practically that of the coil. However. when the condenser is used near minimum capacity, the ratio of the total capacity using air dielectric (low loss) to that using solid dielectric (higher loss) becomes lower and the Q of the condenser is lowered. For this reason, a low-loss condenser set near maximum capacity should be used in Q measurements. — Ed.)

Appendix

1.
$$Q = \frac{2 \times 3.1416 \times 60 \times 2}{100} = 7.54$$

2.
$$L_{600} = \left(\frac{159, 160}{600}\right)^2 \times \frac{1}{410} = 171.6 \ \mu h.$$

3.
$$L_{1200} = \left(\frac{159, 160}{1200}\right)^2 \times \frac{1}{80} = 219.9 \ \mu h.$$

4.
$$L = \frac{1}{4\pi^2 f_1^2 (C_d + C_1)} = \frac{1}{4\pi^2 f_2^2 (C_d + C_2)}$$

 $f_1^2 C_d + f_1^2 C_1 = f_2^2 C_d + f_2^2 C_2$
 $C_d = \frac{f_2^2 C_2 - f_1^2 C_1}{f_1^2 - f_2^2}$

5.
$$L = \frac{1}{4\pi^2 f_1^2 (C_d + C_1)} = \frac{1}{4\pi^2 f_1^2 \left(\frac{f_2^2 C_2 - f_1^2 C_1}{f_1^2 - f_2^2} + C_1\right)}$$
$$= \frac{f_1^2 - f_2^2}{4\pi^2 f_1^2 (f_2^2 C_2 - f_1^2 C_1 + f_1^2 C_1 - f_2^2 C_1)}$$
$$= \frac{f_1^2 - f_2^2}{4\pi^2 f_1^2 f_2^2 (C_2 - C_1)}$$

6.
$$L\mu h = \frac{(f_1^2 - f_2^2) (10^3)^2}{4\pi^2 f_1^2 (10^3)^2 (f_2^2) (10^3)^2} \times \frac{1}{(C_2 - C_1)(10^{-12})}$$

$$=\frac{(f_1{}^2-f_2{}^2)\times 10^{12}}{4\pi^2f_1{}^2f_2{}^2}\times \frac{1}{C_2-C_1}$$

7.
$$L_{1200-600} = \frac{(1200^2 - 600^2) \times 10^{12}}{4\pi^2 (1200^2) (600^2) (410 - 80)}$$

= 159.9 μh .

8.
$$X_L = 2\pi f L$$
 $X_s = \frac{-1}{2\pi f C}$

When L is constant,

$$\frac{dXL}{df} = 2\pi L \qquad \frac{dXe}{df} = \frac{1}{2\pi f^2 C}$$

If these rates of change are equal,

$$2\pi L = \frac{1}{2\pi f^2 C}$$
 or, $2\pi f L = \frac{1}{2\pi f C}$

We know, of course, that at resonance the latter is true.

9.
$$\begin{cases} 4\pi (f_r - f_2)L = R \\ 4\pi (f_1 - f_r)L = R \end{cases}$$
$$\begin{cases} 4\pi f_r L - 4\pi f_2 L = R \\ 4\pi f_1 L - 4\pi f_r L = R \end{cases}$$

Adding,

$$4\pi f_r L - 4\pi f_r L + 4\pi f_1 L - 4\pi f_2 L = 2R$$

 $2R = 4\pi L (f_1 - f_2)$
 $f_1 - f_2 = \frac{R}{2\pi L}$

$$10. \ 2\pi f L - \frac{1}{2\pi f C_2} = R$$

$$\frac{1}{2\pi fC_1} - 2\pi fL = R$$

Adding.

$$2\pi fL - 2\pi fL + \frac{1}{2\pi fC_1} - \frac{1}{2\pi fC_2} = 2R$$

$$\frac{C_2 - C_1}{2\pi fC_1C_2} = 2R$$

1 Michel, "Factor-of-Merit of Short-Wave Coils," G. E. Review, Oct., 1937.

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The pages of the log book often get "dogeared" after use. This can be prevented by placing a paper clip over a dozen or so pages at the corner. — N8FU.

Oklahoma State Convention

ANOTHER Oklahoma State Convention has passed into the historical archives of amateur radio and a "well done" job to the credit of the Tulsa Amateur Radio Club. With an attendance of nearly 200 the sponsoring club seems to have prepared a program for everybody. With early registration Saturday, June 3rd, the program started with a visit to the Spartan Aircraft factory and such a trip enabled the gang to become better acquainted. On the return to the Hotel Tulsa, Director "Bill" Green, W5BKH, took charge of the meeting and discussed fully the 1939 Board of Directors meeting held at San Francisco. Following the discussion a movie of the A.R.R.L. Headquarters, which incidentally had a view of the 1937 board meeting, was shown and gave a good idea how such a meeting is conducted. At the conclusion of the movies everybody adjourned to the Cosmopolitan Club for a buffet supper and what a good time with so many good things to eat and drink. The first day ended with an initiation of the Royal Order of the Wooff Hong, in solemn conclave took place to the satisfaction of many who now belong to the "inner circle" of

Sunday morning saw action in good lectures and speeches: Mr. Zimmerman, W5ERS, presented "some refinements on a simple phone monitor." A representative of the Dallas office of the F.C.C. expressed the eagerness of the F.C.C. to cooperate with the amateurs. Mr. Swift W5FDQ, of Tulsa, explained his famous "Double Barrel" antenna. Some sound remarks were made by Jack Dennis, 5ABZ, of the Public Service Co. on safety problems which was followed by a demonstration of the prone method of artificial respiration by W5BOR.

Fred Stromatt, former Muskogean, now with the Hallicrafters, gave the final technical talk on high-frequency receivers.

With the big banquet beginning at 1:30 P.M., enjoyed by all and the drawing of prizes the convention came to an end with the thanks of all to the convention committee for their successful efforts in holding this year's convention.

Wisconsin State Convention

Over 200 amateurs from 53 cities journeyed to Wausau, Wisconsin, for the first state A.R.R.L. convention, September 2nd and 3rd, 1939. Activities started when Mayor Polster greeted the gang and handed them the keys to the city with instructions on how to handle the local police force. Mr. Murray, from F.C.C's Chicago.

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tinge o One presen office, spoke on "The Amateur and the B.C.L." Saturday afternoon was devoted to technical talks, with Rex Munger, W9LIP, giving the low-down on carbon anodes, and "Beep" Phelps, W9BP, using 11/4-meter scale models of various directive antenna systems to show the advantages and drawbacks of each type. Movies of League headquarters and a few reels of Twin Cities amateurs' ham shacks were shown at the evening party, followed by dancing and refreshments, and climaxed by a midnight conclave of the R.O.W.H., strikingly presented by the Milwaukee Radio Amateurs' Club.

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A trip to Rib Mountain, highest point in the state, featured Sunday morning's program, where the Wisconsin Forestry Service and local hams collaborated to demonstrate their 32-Mc. fire tower intercommunication systems. Starting the afternoon program off with a bang, Mr. Kreuger, safety engineer of the local power company, presented a vivid demonstration of artificial respiration and a discussion on safety consciousness. At the A.R.R.L. meeting, SCM Al Krones, W9UIT, Alternate Director Kreis, W9HRM, Assistant Director (Dakota Division) Emerson, W9ITQ, and Headquarters Representative John Huntoon, W1LVQ, spoke on League matters, followed by an open forum meeting, C. E. Smith. W9ZTO, presided over the Sunday evening banquet and introduced W. B. Chilsen, local publisher, who entertained the gang with his Scandinavian stories. Prize drawings concluded the evening. The Wisconsin Valley Radio Assocition are to be congratulated on their fine handling of Wisconsin's first amateur convention.

West Gulf Division Convention

Some two hundred and fifty delegates invaded Wichita Falls, Texas, on September 8th and 9th for the thirteenth annual convention, and proceeded to forget war, economics, and all else except ham radio and a good time. That they all succeeded in this was the unanimous opinion.

Sponsored by the Wichita Falls Amateur Radio Club, the convention got under way Friday morning, September 8th, with registration at the Marchman Hotel. The convention officially opened at 1:30 P.M. with a fine welcome address by "hizzoner" Mayor W. E. Fitzgerald, and answered by "Bud" Budlong of the A.R.R.L. staff. The precision with which the program and activities were carried out was indicative of the fine work of the convention committee, headed by W5ARS, David Clark and composed of W5AAM, Champ Smith: W5GTJ, Jess Stanbrough: W5CEE, Ivan Davis; W5GJW, Charles Stokes and W5NIY, Mike Davis. Every member of the Wichita Falls Club contributed his services, suggestions and criticisms, with the result that everyone attending left the convention with a little tinge of regret that "all good things must end." One of the finest radio equipment shows ever

presented in the West Gulf Division was provided (Continued on page 118)



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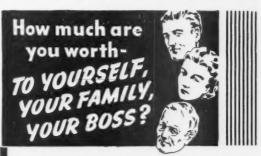
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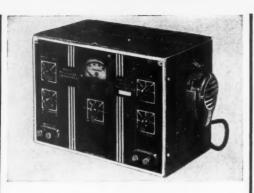
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by the manufacturers and distributors. Everything to gladden the heart or catch the eye of a ham was shown, from transparent spreaders to rotary beam.

Technical talks were made by M. P. Mims of Texarkana, Ark., - the old original "signal squirter" himself; and a discussion of the new Eimac 75-T by "Bill" Eitel of Eitel-McCul-

lough, San Bruno, Calif.

Timely comments by A. L. Budlong, assistant secretary of the League Headquarters, were made. Group meetings or O.R.S., N.C.R., A.A.R.S., etc., brought excellent talks by prominent amateurs such as Carl Nuhn, W5EOE, R.M. of North Texas; W5CEZ, "Cart" Simpson, S.C.M. Oklahoma Section; W5BKH, Ensign "Bill" Green. director of the West Gulf Division, and David Calk, W5BHO, S.C.M. Southern Texas. Lieut.-Commander John J. Pierpont, U.S.N., who was just assigned to the eighth Naval District as communication officer on July 1st, flew over from Pensacola to attend the convention. The lighter side of the convention was amply provided by an open-air "barbecue" (North Texas style), followed by a dance and "hamboree" at one of the city's hot spots. For the ladies a nice program of entertainment was provided by the YF's of the W.F.R.C., including a bridge breakfast at the swanky Wichita Club, and a matinée "moonpitcher" party which included the showing as a special attraction Pete Smith's specialty "Radio Hams.'

As expected, the banquet (on which Wichita Falls' reputation has been built) was the big event of the convention. With "Chas." Stokes, W5GJW, acting as master of ceremonies, the noted guests were introduced, including Lieut.-Commander Pierpont, U.S.N.; A. L. Budlong, A.R.R.L.; Bill Green, Director; "Soupy" Groves, Past Director; "Dick" Hall representing the jobbers and M. F. Klicpera representing the manufacturers.

After awarding the numerous prizes, the "dogfight" between Fort Worth and Galveston for the 1940 convention waxed hot and heavy, with Fort Worth emerging the victor in a spirited fight, high-lighted by some brilliant wit and horseplay.

The midnight conclave of the R.O.W.H. initi-

ated 20 members.

The convention was a huge success, and the hard-working Wichita Falls amateurs deserve a big vote of thanks for their efforts.

- W5GJW

Atlantic Division Convention

THE population of Pittsburgh was swelled during June 23rd and 24th by 427 amateurs attending the 1939 Atlantic Division Convention at the Fort Pitt Hotel, sponsored by the Pittsburgh Area Radio Club Council.

After going through the necessary routine of registration on Friday morning, the delegates gathered to see motion pictures, under supervision of Mr. Henry Rockwood of the U.S. Weather Bureau, taken during the 1936 flood in and around

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Pittsburgh. Following up an apparent keynote of emergency-consciousness, C. G. Landis, W3UA, gave an illustrated talk on the Susquehanna Valley Amateur Emergency Net and Roy Corderman, W3ZD, discussed portable radio stations. A technical discussion of crystal oscillators was given by John Reinartz, W1QP. The evening program began with a humorous dramatization of "BCL QRM." H. F. Webb, Safety Engineer from the West Penn Power Company, gave a talk and demonstration on artificial respiration.

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Saturday morning many of the delegates went on a tour of the city of Pittsburgh and its noted points of interest. In the afternoon, Rex Munger, W9LIP, spoke on amateur tube applications; Messrs. Cole and McLaughlin had the crowd guessing at their satirical take-off entitled "Crystals"; and Donald Exner, W8ZU, unraveled the intricacies of grid-modulated 'phone transmitters. President Woodruff presented for the gang's approval another edition of his famous "bag of tricks," and Dr. Philip Thomas, of Westinghouse, delighted the assembly with his demonstration of some unusual and spectacular applications of radio and electricity.

The convention was brought to a close with the banquet Saturday evening under the capable toastmastership of Director Martin, W3QV. Honored guests were Dr. Frank Conrad of W8XK, President Woodruff and A. L. Budlong, W1JFN, Headquarters representative. As a climax, the prizes were distributed to the winners.

Central Division Convention

THE Columbus Amateur Radio Association provided a bang-up program of education and entertainment to 425 amateurs and associates attending the 1939 Central Division convention in their city, September 8th-9th-10th. Since many of those present did not arrive until Friday evening, the afternoon sessions that day, consisting of talks on commercial receivers and microphones, were not well attended. Edward C. Jordan, Ohio State University, spoke on antenna fundamentals and field patterns, featuring the evening technical session.

League matters were discussed at the Saturday morning meeting, with talks by G. L. Dosland, W9TSN, Assistant Director, and John Huntoon, WILVQ, headquarters representative. An open forum followed, brought to a conclusion only by the call to lunch. Starting off the afternoon sessions, again under the chairmanship of R. C. Higgy, W8LFE, Prof. W. L. Everitt of Ohio State gave the technically-minded much food for thought in his discussion of impedance relationships. Karl Kopetzky held the group's interest with his demonstration of the "dialomatic" rig, while John Kraus, W8JK, drew the largest crowd to witness his practical demonstration of how to trouble-shoot transmission lines. Adjourning preparatory to dinner, the delegates found ample time to look over the many exhibits of amateur equipment on display by manufacturers. At the

(Continued on page 120)

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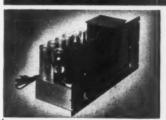
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banquet itself, Columbus's reputation for enjoyable entertainment was well upheld, and for two hours local talent kept the gang thoroughly amused. A few introductions of notables present. with an appropriately-short word from each. concluded the evening.

Lt. Col. Hineman presided at the A.A.R.S. group meeting the following morning, while Lt.-Com. Tummonds, N.C.R. W8BAH, took charge of the N.C.R. discussions. The delegates reconvened immediately after lunch for the drawing of prizes, and the 1939 convention became history. During the three-day affair, the ladies were well entertained with shopping trips, theatre and bridge parties.

-J. H.

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Massachusetts State Convention

PREPARING a convention program to take care of an attendance of 1000 enthusiastic hams with their XYL's and YL's means real hard work, therefore the joint convention committee of the South Shore Amateur Radio Club and the Eastern Massachusetts Amateur Radio Association, which sponsored this year's State Convention and Boston Hamfest held in Boston. Mass., on October 21st deserve credit. Early Saturday morning the Hotel Bradford began filling up with groups from all over the state, and several delegations from surrounding states. which kept the registration desk busy every minute until banquet time. All formalities being dropped to save time the beginning of contests (both serious and humorous) started promptly under the supervision of W1IYU and W1JCX proving most interesting to the participants and the guests. The U.S. Army gave a demonstration of a "Walkie Talkie" which was followed by a good talk on Frequency Modulation ably presented by Paul DeMars. Then followed meetings for the DX man and Emergency 'Phone Net, W1LZ had a roomful for the DX meeting and it proved so interesting it overlapped the time assigned. Larry Mitchell, W1HIL, the SCM for Eastern Mass. Section, had charge of the A.R.R.L. meeting and the keynote of this meeting was emergency communication and neutrality. Mr. J. M. Henry, Engineering Department of N.E.T. & T. Co., spoke on some interesting phases of long range radio telephony. Illness of Director Perc Noble, prevented his attendance, but the division was well represented by Russ Bennett, W1GTN, Alternate Director, who took charge of the A.A.R.S. meeting and also spoke for the director at the Banquet. Boston is renowned

(Continued on next left-hand page)

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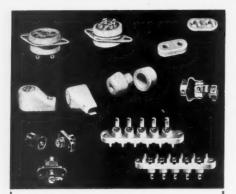
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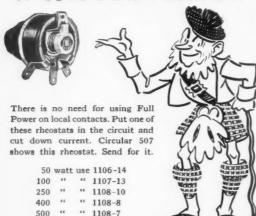


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for its food and the multitude sat down at the festive board with a good old-fashioned turkey dinner with all the fixings. Of course there are always speeches at banquets, but George Bailey, W1KH, the perennial toastmaster, very ably kept each speaker to two minutes. Don McBeth, W1FSK, the general chairman, extended the greetings of the committee and the clubs sponsoring the affair and then a few words from Dr. Eugene C. Woodruff, W8CMP, President of the A.R.R.L.; Arthur A. Hebert, A.R.R.L. Veteran Treasurer; Charles C. Kolster, the likable Radio Inspector of the First district. The Army and Navy were officially represented. After enjoying the banquet everyone adjourned to the "Prize" room where the drawing for prizes began, and what a lot of worth-while prizes too, and we must not forget the cooperation given the committee by the radio dealers for their fine exhibits. And so came to an end another one of those good conventions.

The Vermont State Convention

THE enthusiasm of the Vermont radio amateurs always makes up for lack of numbers and this was well demonstrated on Saturday, October 14th, when the Green Mountain Radio Club acted as host for the annual convention held in Rutland. Early Saturday hams with their YL's and XYL's began to arrive and by twelve o'clock noon the Hotel Bardwell was buzzing with the greetings of friends old and new. After the ladies started for the theatre party the regular planned meetings got underway. W1AVP, the PAM, took charge of the 'phone meeting, followed by the NCR meeting in charge of W1GYG. The A.A.R.S. was well represented, having as its guest Lieut.-Colonel Huston, Signal Officer, 1st Corps Area. This meeting was in charge of W1FSV, State Radio Aide. Director Noble who is also National Radio Aide, participated in many of the meetings, assisted by F. E. Handy, the A.R.R.L. Communications Manager. The traffic and emergency meeting, under the leadership of Cliff Parker, W1KJG, the SCM for Vermont, was replete with interesting discussions, and when the time came to sit down at the banquet the crowd was ready and enjoyed the good meal served. Attorney Milford K. Smith did the honors as toastmaster and saw to it that everything went smoothly. The skit of W1AAJ was thoroughly enjoyed and with the drawing of the prizes and dancing from 9:00 to midnight everyone was willing to call it a day. The thanks of those present go to Bob Teachout, W1FSV, and his committee for again making it possible to have this annual convention.

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